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GARDEN LIBRARY

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Volume XLV Number 1

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FEBRUARY, 1958

Flora of Panama. Part VII, Fascicle 1 (Passifloraceae to Cactaceae)
. . Robert E. Woodson, Jr., Robert W. Schery and Collaborators 1–91

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Miss Nell C. Horner resigned as Editor of Publications of the Missouri Botanical Garden in December, 1957, after 42 years with the Garden. The high quality of the Annals is evidence of her skill as an editor. The many students and staff members who published papers in the Annals recall fondly the advice and help they received and the painstaking care devoted to their manuscripts.

HUGH CUTLER,
Acting Director

FLORA OF PANAMA

BY

ROBERT E. WOODSON, JR.

AND

ROBERT W. SCHERY

AND COLLABORATORS

PART VII

Fascicle 1

PASSIFLORACEAE
CARICACEAE
LOASACEAE
BEGONIACEAE (L. B. Smith and B. G. Schubert)
CACTACEAE

ANNALS
OF THE
MISSOURI BOTANICAL GARDEN

Vol. XLV FEBRUARY, 1958 No. 1

FLORA OF PANAMA

Part VII. Fascicle 1*

PASSIFLORACEAE

1. PASSIFLORA L.

PASSIFLORA L. Sp. Pl. 955. 1753; Killip, in Field Mus. Publ. Bot. 19:1–613. 1938.

Granadilla [Tourn. ex Rupp.] Adans. Fam. 2:408. 1763.
Cieca Medik. Malvenfam. 97. 1787.
Murucuja [Tourn.] Medik. loc. cit. 1787.
Tacsonia Juss. Gen. 398. 1789.
Erndelia Neck. Elem. 2:235. 1790.
Distephana Juss. in Ann. Mus. Paris 6:396. 1805.
Psilanthus Juss. loc. cit. 1805.
Baldwinia Raf. in Amer. Monthly Mag. 267. 1818, non Torr. & Gray.
Astephananthes Bory, in Ann. Gén. Sci. Phys. 2:138. 1819.
Monactineirma Bory, loc. cit. 1819.
Anthactinia Bory, loc. cit. 139. 1819.
Polyanthea DC. in Mém. Soc. Phys. Genève 1:435. 1822.
Disemma Labill. Sert. Austro-caled. 78. 1824.
Distephia Salisb. ex DC. Prodr. 3:335. 1828.
Astrophea Rchb. Consp. 132. 1828.
Blephistelma Raf. Fl. Tellur. 4:103. 1836.
Macrophora Raf. loc. cit. 1836.
Meioperis Raf. loc. cit. 1836.
Tripsilina Raf. loc. cit. 1836.
Xerogona Raf. loc. cit. 1836.
Peremis Raf. loc. cit. 104. 1836.
Pericodia Raf. loc. cit. 1836.
Synactila Raf. loc. cit. 1836.
Odostelma Raf. loc. cit. 1836.
Distephania Steud. Nom. 1:521. 1840.
Dysosmia Roem. Synops. Monogr. 2:149. 1846.
Pentaria Roem. loc. cit. 131, 187. 1846.
Decaloba Roem. loc. cit. 131, 152. 1846.
Distemma Lem. Fl. des Serres 236. 1847.
Poggendorffia Karst. in Linnaea 28:438. 1856.
Rathea Karst. Fl. Colomb. 1:77. 1859.
Ceratosepalum Oerst. Rech. Fl. Amér. Centr. 18. 1863.

Herbaceous or woody lianas, usually climbing by tendrils, rarely erect herbs, shrubs, or small trees. Leaves alternate, petiolate, basifixed to peltate, simple or very rarely compound, entire to deeply lobed, occasionally with large irregular glandular areas (ocellate) upon the blade; petiole frequently with few to several more or less conspicuous glands. Tendrils volubile, solitary, simple, axillary or

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* Assisted by a grant from The National Science Foundation.

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produced from the inflorescence. Inflorescence axillary, usually 1-flowered, less frequently cymose and few-flowered, the peduncle jointed and there producing usually 3 inconspicuous and setaceous to large and petaloid involucrate bracts. Flowers hermaphrodite, actinomorphic, frequently large and showy, perigynous. Hypanthium shallow to relatively deep, the sepals 5, valvate, usually with a corniculate process toward the tip in the large-flowered species; petals 5, rarely absent, inserted at the margin of the hypanthium, green to highly colored; corona of numerous petaloid filaments in 1 to several centripetally decreasing series inserted on the margin of the hypanthium at the base of the corolla. Pistil and stamens borne upon a more or less elongate common androgynophore; stamens 5, borne immediately beneath the pistil, the anthers 2-celled, versatile; pistil 3- or very rarely 4-carpellate, the ovary 1-loculate with 3 or very rarely 4 parietal placentas bearing numerous ovules, the 3–4 stigmas usually quite sessile, rather elongate, radial. Fruit an inflated berry, frequently large, globose to fusiform, containing numerous small hard lenticular seeds immersed in abundant mucilaginous pulp derived from the testa.

Although the Passifloraceae include a few small genera of the Old World as well, the large genus *Passiflora* is confined to the Americas in its indigenous distribution, although numerous species with showy flowers and edible fruits have been introduced into the tropics of the Eastern Hemisphere and are frequently cultivated in greenhouses in the colder latitudes. In America native species are found from the south-central United States to Argentina.

Their extremely complicated and frequently large and brightly colored flowers have attracted several botanists to the special study of the Passifloras, the most recent of whom is E. P. Killip. In his study of *Passiflora*, Killip recognizes 353 species which are distributed amongst no less than 22 subgenera, chiefly based upon rather intricate differences in flower structure. Twenty-six species have been discovered in Panama to which at least a few additions undoubtedly will be made in the future. The present account has been drawn very largely from that of Killip's monumental work, although the keys are original and the species concept has been changed in a few minor instances. The authors of this Flora are grateful to Mr. Killip for the generous cooperation which he has given them in the naming of their study material over many years.

Early Spanish missionaries to the New World saw in the radiant flowers of *Passiflora* a symbol of the Crucifixion, and from this inspiration the Spanish popular name *pasionaria* and the English "Passionflower" have had their origin. Less reverent Spanish names of frequent application to various species are *calzoncillo* and *ala de murciélago*. The large pulpy berries of various species, particularly the frequently cultivated *P. edulis* and *P. quadrangularis* are known as *granadillas* and are eaten raw or more often cooked with milk to make a kind of dessert.

a. Flowers typically rather small, mostly less than 5 cm. in diameter, usually paired or several at the nodes (usually solitary in *P. punctata*); sepals not corniculate toward the tip; bracts small and setose, very inconspicuous; petiolar glands usually 2 when present.

b. Flowers 2 upon a common elongate peduncle, the associated tendril terminal; plants glabrous and very glaucous; leaves small, suborbicular, entire or nearly so; petiole with 2 foveate glands at the juncture with the blade..... 1. P. TRYPHOSTEMMATOIDES

bb. Flowers 1 or several upon paired (occasionally solitary) peduncles, the associated tendril basal.

c. Petioles eglandular.

d. Flowers few or several upon each peduncle; plants densely pubescent. ..... 2. P. SEXFLORA

dd. Flowers solitary upon each peduncle; plants glabrous or very inconspicuously pubescent.

e. Leaves basifixed; stipules minute and setose.

f. Peduncles jointed at about the middle or somewhat below; flowers usually paired at the nodes..... 3. P. BIFLORA

ff. Peduncles jointed far above the middle, almost directly beneath the flower.

g. Leaves about twice as long as broad or nearly so, very broadly 3-lobed with the central lobe stronger, occasionally nearly entire; flowers usually paired at the nodes..... 4. P. LANCEARIA

gg. Leaves about as broad as long; flowers usually paired at the nodes.

h. Leaves with 2 strongly ascending lateral lobes, rarely with a weak central lobe; petals absent..... 5. P. APETALA

hh. Leaves about equally 3-lobed; petals present..... 6. P. PANAMENSIS

ggg. Leaves much broader than long, with 2 nearly transverse lateral lobes; flowers usually solitary at the nodes..... 7. P. PUNCTATA

ee. Leaves eccentrically peltate, entire or if 3-lobed the central lobe far stronger; stipules large and foliaceous, amplexicaul, ciliate-serrate, deciduous. ..... 8. P. HAHNII

cc. Petioles glandular.

d. Leaves eccentrically peltate, deeply 3-lobed, the lateral lobes nearly transverse and as strong as the central to much stronger; stipules inconspicuous and subsetaceous..... 9. P. CORIACEA

dd. Leaves basifixed.

e. Flowers typically 2 or more upon a short common peduncle; leaves broadly 3-lobed, the lobes rounded, occasionally mucronulate, the central far stronger; petiolar glands inconspicuous, broadly poculiform..... 10. P. HOLOSERICEA

ee. Flowers solitary upon each peduncle; leaf lobes acute to acuminate; petiolar glands conspicuously elevated.

f. Leaves entire or subentire with the lateral lobes reduced to inconspicuous angles; petiolar glands very large and auricular, borne toward the base of the petiole..... 11. P. AURICULATA

ff. Leaves definitely 3-lobed; petiolar glands rather inconspicuous, borne about midway or higher upon the petiole.

g. Petiolar glands borne about midway upon the petiole; petals present, linear..... 12. P. PEDICULATA

gg. Petiolar glands borne almost directly beneath the leaf blade; petals absent..... 13. P. SUBEROSA

aa. Flowers typically rather large, mostly more than 5 cm. in diameter, solitary at the nodes (except occasionally in *P. adenopoda*); sepals usually conspicuously corniculate toward the tip (except in *P. pulchella* and *P. membranacea*); bracts conspicuous and involucrate, foliaceous or petalaceous; petiolar glands usually more than 2 when present.

b. Involucral bracts entire, serrulate, or simply lacerate.

c. Sepals not corniculate; petioles not glandular.

d. Leaves cuneately 2-lobed, occasionally with a small central lobe; stipules inconspicuous and subsetaceous; involucral bracts obovate, obtuse or acute at the base, 1.0–1.5 cm. long; flowers about 4–6 cm. in diameter..... 14. P. PULCHELLA

dd. Leaves suborbicular, indistinctly 3-lobed; stipules conspicuously foliaceous; involucral bracts suborbicular, deeply cordate, about 3–5 cm. long; flowers about 7–8 cm. in diameter..... 15. P. MEMBRANACEA

cc. Sepals corniculate; petioles glandular.

d. Leaves palmately 3- to 7-parted to below the middle, the central lobe somewhat contracted toward the base.
e. Involucral bracts much shorter than the sepals, free and never enveloping the flower bud, serrate or lacerate.
f. Leaves 5- to 7-lobed (very rarely 3-lobed) petiolar glands very large and prominently stipitate, borne almost directly beneath the leaf blade; involucral bracts lacerate; flowers purple and white..... 16. P. ADENOPODA
ff. Leaves 3-lobed; petiolar glands inconspicuous and sessile, borne toward the base of the petiole; involucral bracts glandular-serrulate; flowers scarlet and yellow..... 17. P. VITIFOLIA
ee. Involucral bracts almost as long as the sepals, united toward the base and completely enveloping the flower bud, entire; flowers violet and white..... 18. P. WILLIAMSII
dd. Leaves entire, or palmately 3-lobed above or about the middle and with the central lobe not constricted toward the base.
e. Leaves 3-lobed.
f. Plants more or less pilose; leaves lobed above the middle, the central lobe much stronger; petioles with 2 to several pairs of glands; involucral bracts rather narrowly lanceolate, foliaceous..... 19. P. MENISPERMIFOLIA
ff. Plants glabrous; leaves lobed to about the middle, the 3 lobes subequal; petioles with 1 pair of glands; involucral bracts broadly ovate, somewhat petalaceous..... 20. P. SUBPELTATA
ee. Leaves entire, deeply cordate in some species.
f. Stipules very conspicuously foliaceous.
g. Stipules equilateral, deciduous; involucral bracts about as long as the sepals.
h. Stems not winged; leaves deeply cordate; petioles with filiform glands. ..... 21. P. LIGULARIS
hh. Stems prominently winged; leaves rounded at the base to obscurely cordate; petioles with ovoid glands..... 22. P. QUADRANGULARIS
gg. Stipules strongly inequilateral, persistent; involucral bracts about half as long as the sepals..... 23 P. OERSTEDII
ff. Stipules inconspicuous and subsetaceous or barely foliaceous.
g. Leaves obtuse or very slightly cordate at the base; involucral bracts free.
h. Leaves entire; petioles glandular at the middle or below; flowers maroon, purple and white..... 24. P. AMBIGUA
hh. Leaves serrate or serrulate; petioles glandular above the middle; flowers white and purple..... 25. P. NITIDA
gg. Leaves deeply cordate at the base; petioles glandular directly beneath the leaf blade; involucral bracts united at the base; flowers purple and white..... 26. P. SEEMANNII
bb. Involucral bracts complexly 2- or 3-pinnatifid, each filiform division gland-tipped; plants hirsutulose; petioles with scattered gland-tipped hairs; flowers greenish white more or less tinged with purple..... 27 P. FOETIDA

Other species, at present known from Costa Rica and Colombia, are to be expected in Panama as well.

1. PASSIFLORA TRYPHOSTEMMATOIDES Harms, in Engl. Bot. Jahrb. 18: Beibl. 46:6. 1894; Killip, in Field Mus. Publ. Bot. 19:81. 1938.

Passiflora gracilimma Killip, in Journ. Wash. Acad. Sci. 14:112. *fig. 2b.* 1924.

Plants slender, climbing, glabrous and very glaucous throughout. Leaves long-petiolate, simple, entire, suborbicular, about 1.5–4 cm. long and 1.5–3.0 cm. broad, very pale beneath, darker above; petioles very slender, about 1–2 cm. long, bearing 2 rather inconspicuous foveate glands at the juncture with the leaf blade; stipules setose, very inconspicuous. Inflorescence of 2 greenish white flowers upon an

elongate common peduncle, the associated tendril terminal; peduncle 0.5–4.5 cm. long; pedicels 1.5–4.0 cm. long, jointed somewhat above the middle, the bracts minutely setose, deciduous. Flowers 1.5–4.0 cm. in diameter; sepals oblong, about 0.7–1.5 cm. long, not corniculate; petals narrowly oblong, 0.5–1.0 cm. long; filaments of the corona in a single series, filiform, 3–5 mm. long. Berry subglobose to ovoid, 3–6 cm. long, greenish yellow.

Panama and Colombia, in wet forests of middle elevations.

BOCAS DEL TORO: Fish Creek Hills, *Von Wedel 2421, 380.* CHIRIQUÍ: exact locality uncertain, *Hart 104.*

There seems to be little room for doubt that *P. tryphostemmatoides* and *P. gracilimma* are conspecific (cf. Killip, in Field Mus. Publ. Bot. 19:82. 1838), since they are not closely related to other species, their characters overlap or at least intergrade, and both have been reported from closely adjacent stations both in Panama and Colombia. No intermediate stations between Bocas del Toro (probably Hart's "Chiriqui") and the Atrato valley in Colombia have been discovered as yet, but they are to be expected since the Caribbean coast of Panama still is known so poorly.

2. PASSIFLORA SEXFLORA Juss. in Ann. Mus. Hist. Nat. 6:110. *pl. 37. fig. 2.* 1805; Killip, in Field Mus. Publ. Bot. 19:129. 1938.

Passiflora pannosa J. E. Sm. in Rees, Cycl. 20: *Passiflora* no. 28. 1819.
Passiflora capsularis var. *geminiflora* DC. Prodr. 3:325. 1828 (as *geminifolia*).
Meioperis pannosa (J. E. Sm.) Raf. Fl. Tellur. 4:103. 1838.
Cieca pannosa (J. E. Sm.) M. Roem. Fam. Nat. Syn. 2:148. 1846.
Decaloba sexflora (Juss.) M. Roem. loc. cit. 164. 1846.
Passiflora floribunda Lem. Fl. des Serres 4:335b. 1848.
Passiflora triflora Macf. Fl. Jam. 2:149. 1850.
Passiflora miraflorensis Killip, in Journ. Wash. Acad. Sci. 14:109. 1924.
Passiflora isotriloba Cuf. Archivio Bot. 9:196. 1933.

Plants rather slender, climbing, densely pubescent throughout. Leaves petiolate, simple, basifixed, subtrapezoid, the top saliently and acutely 2-lobed, occasionally with a smaller central lobe, the base rounded or slightly cordate, 3–9 cm. long, 4–10 cm. broad; petioles 1–3 cm. long, eglandular; stipules subulate, about 5 mm. long. Inflorescence bearing 2–10 greenish-white, purple-tinged flowers upon a common peduncle 2–3 cm. long, the associated tendril basal; pedicels 1.0–1.5 cm. long, subtended by an inconspicuous subulate bract. Flowers 2–3 cm. in diameter; sepals oblong-lanceolate, 8–15 mm. long, not corniculate; petals linear, about 10 mm. long; filaments of the corona in 2 series, the outer about as long as the petals. Fruit subglobose, 5–10 mm. in diameter, greenish yellow.

Southern Florida; Mexico to northern Colombia; Greater Antilles. Clearings in wet forests, 1300–2000 m. in Panama.

BOCAS DEL TORO: Robalo Trail, northern slopes of Cerro Horqueta, *Allen 4928.* CHIRIQUÍ: Bajo Mono, Boquete District, *Davidson 491*; vicinity of Bajo Mona and Quebrada Chiquero, *Woodson & Schery 519*; valley of the upper Río Chiriquí Viejo, vicinity of Monte Lirio, *Seibert 180*; Río Ladrillo, above El Boquete, *Pittier 3286.*

Fig. 1. *Passiflora sexflora*

3. PASSIFLORA BIFLORA Lam. Encycl. 3:36. 1789; Killip, in Field Mus. Publ. Bot. 19:185. 1938.

Passiflora lunata J. E. Sm. Icon. Pl. Rar. 11: *pl. 1*. 1790, non Juss. nec Vell. necque Poepp. & Endl.
Passiflora glabrata HBK. Nov. Gen. & Sp. 2:135. 1817.
Cieca glabrata (HBK.) M. Roem. Fam. Nat. Syn. 2:143. 1846.
Decaloba biflora (Lam.) M. Roem. loc. cit. 2:161. 1846.
Decaloba biflora var. *major* M. Roem. loc. cit. 1846.
Decaloba biflora var. *mexicana* M. Roem. loc. cit. 1846.
Passiflora lunata var. *costata* Mast. in Mart. Fl. Bras. 13[1]:552. 1872.
Passiflora spathulata Mast. loc. cit. 1872.
Passiflora brighami S. Wats. in Proc. Amer. Acad. 21:473. 1887.
Passiflora transversa Mast. in Bot. Gaz. 16:7. 1891.

Plants rather slender, climbing, essentially glabrous throughout, the stems conspicuously striate. Leaves rather shortly petiolate, simple, basifixed, subtrapezoid, the top saliently and obtusely 2-lobed, occasionally with a smaller central lobe or mucro, the base obtuse to broadly rounded, 1–10 cm. long, 5–10 cm. broad, conspicuously glandular-ocellate; petioles 0.5–3.0 cm. long eglandular; stipules minutely setose. Inflorescences bearing solitary greenish white or yellow flowers upon paired peduncles, the associated tendril basal; peduncles about 1.0–1.5 cm. long, jointed at about the middle or somewhat below; bracts very inconspicuous, subsetaceous. Flowers 3–4 cm. in diameter; sepals ovate-lanceolate, about 1 cm. long, not corniculate; petals oblong-lanceolate, slightly shorter than the sepals; filaments of the corona in 2 series, the outer about as long as the petals. Fruit subglobose, 1–2 cm. in diameter, greenish yellow.

Mexico to Colombia and Venezuela; Bahamas; from near sea level to about 1,500 m. Widely distributed and common in Panama.

BOCAS DEL TORO: Shepherd Island, *Von Wedel 2694, 2737*; Water Valley, *Von Wedel 998, 1697*; Snapper Point, *Von Wedel 2645*; vicinity of Chiriquí Lagoon, *Von Wedel 384, 1218, 1305*. CANAL ZONE: Ancón Hill, *Woodson, Allen & Seibert 716*; Chagres, *Fendler 121*; Ancón, *Pittier 2578, Standley 12107*; Culebra, *Pittier 2091, Standley 25982*; Empire to Mandinga, *Piper 5520*; Fort Sherman, *Standley 31040, 31184, Stevens 1046*; Frijoles, *Piper 5806*; Barro Colorado Island, *Bailey & Bailey 311, Wetmore & Abbe 140, Woodworth & Vestal 307*. CHIRIQUÍ: El Boquete, *Killip 3608*; David, *Killip 3640*. COCLÉ: Penonomé, *Williams 226*. COLÓN: Porto Bello, *Pittier 2461*; Catival, *Standley 30349*. PANAMÁ: Panamá Vieja to Bella Vista, *Allen 826*; Las Sabanas, *Standley 25835*; Taboga Island, *Standley 27844, Pittier 3607*; San José Island, *Erlanson 183, 219, Johnston 809, 1189, 549*; Tumba Muerto Road near Panamá, *Standley 29802*; Trapiche Island, *Miller 1893*; Taboguilla Island, *Miller 2011*.

Popular names of this weedy climber are *guate-guate*, *camacarlata*, and *calzoncillo*.

4. PASSIFLORA LANCEARIA Mast. in Journ. Bot. 23:114. 1885; Killip, in Field Mus. Publ. Bot. 19:160. 1938.

Passiflora talamancensis Killip, in Journ. Wash. Acad. Sci. 12:260. 1922.

Rather massive climbers, essentially glabrous throughout. Leaves rather long-petiolate, simple, basifixed, oblong-elliptic and entire to the tip or very broadly

3-lobed with the central lobe stronger than the lateral, obtuse to rounded at the base, 5–12 cm. long, 2–9 cm. broad, membranaceous to subcoriaceous, rather conspicuously glandular-ocellate; petioles 1–4 cm. long, eglandular; stipules subsetaceous, inconspicuous. Inflorescences bearing solitary greenish-white, faintly purple-tinged flowers upon usually paired peduncles, the associated tendril basal; peduncles about 2–5 cm. long, jointed far above the middle almost directly beneath the flower; bracts inconspicuously subsetaceous. Flowers 3–4 cm. in diameter; sepals ovate-lanceolate, 1.0–1.5 cm. long, not corniculate, glabrous to more or less puberulent within; petals about half to one third as long as the sepals; filaments of the corona in 2 series, the outer about as long as the petals. Fruit subglobose, 2–3 cm. in diameter.

Costa Rica and Panama, from near sea level to about 1,700 m. altitude.

BOCAS DEL TORO: Old Bank Island, *Von Wedel 2120*. CHIRIQUÍ: Bajo Chorro, Boquete District, *Davidson 336*.

This is a representative of a very complex group of species the affinities of which are far from clear. Perhaps our plants should be referred to *P. mollis* HBK.

5. PASSIFLORA APETALA Killip, in Journ. Wash. Acad. Sci. 12:255. 1922.

Plants rather slender, climbing, glabrous throughout. Leaves rather long-petiolate, simple, basifixed, broadly cuneate-subtrapezoid, with 2 strongly ascending lateral lobes, rarely with a weak central lobe, broadly obtuse or rounded at the base, 3–10 cm. long and broad, inconspicuously glandular-ocellate; petioles 1–5 cm. long, eglandular; stipules minute and subsetaceous. Inflorescences bearing solitary yellowish green flowers upon paired peduncles, the associated tendril basal; peduncles about 1.5–4.0 cm. long, jointed above the middle; bracts inconspicuous and subsetaceous. Flowers about 2 cm. in diameter; sepals narrowly oblong-lanceolate, about 1 cm. long, not corniculate; petals absent; filaments of the corona in 1 series, about half as long as the sepals or less. Fruit globose, about 1 cm. in diameter, dark purple.

Costa Rica and Panama, in clearings of forests at 1,000–2,000 m.

CHIRIQUÍ: trail from Bambito to Cerro Punta, *Allen 316*; Chiquero, *Davidson 511*; Bajo Mona, mouth of Quebrada Chiquero, *Woodson, Allen & Seibert 1016*; Bajo Mona and Quebrada Chiquero, *Woodson & Schery 583*; vicinity of "New Switzerland", central valley of Río Chiriquí Viejo, *Allen 1346*; valley of upper Río Chiriquí Viejo, vicinity of Monte Lirio, *Seibert 160, G. White 25*; Alto Lino, *Bro. Maurice 835*.

6. PASSIFLORA PANAMENSIS Killip, in Journ. Wash. Acad. Sci. 12:259. 1922.

Plants rather slender, climbing, glabrous throughout. Leaves long-petiolate, simple, basifixed, broadly 3-lobed, the lobes ascending, acute, and essentially equal, broadly rounded at the base, 5–12 cm. long and broad, conspicuously glandular-ocellate; petioles 1.5–3.0 cm. long, eglandular; stipules inconspicuous and subsetaceous. Inflorescences bearing solitary greenish lavender-tinged flowers upon paired peduncles, the associated tendril basal; peduncles 2–4 cm. long, jointed almost immediately beneath the flower; bracts minute, subsetaceous. Flowers about

3 cm. in diameter; sepals oblong-lanceolate, 1.0–1.5 cm. long; petals oblanceolate, about half as long as the sepals; filaments of the corona in 2 series, the outer about as long as the petals. Fruit globose, about 2 cm. in diameter, purple.

Eastern Panama and adjacent Colombia, in lowland forests.

DARIÉN: along Sambú River, *Pittier 5556*.

7. PASSIFLORA PUNCTATA L. Sp. Pl. 957. 1753; Killip, in Field Mus. Publ. Bot. 19:183. 1938.

Passiflora misera HBK. Nov. Gen. & Sp. 2:136. 1817.
Passiflora maximiliana Bory, in Ann. Gen. Sci. Phys. Brux. 2:149. *pl. 24.* 1819.
Passiflora vespertilio Ker, Bot. Reg. 7: *pl. 597.* 1821, non L.
Passiflora discolor Link & Otto, Icon. Pl. Select. 13: *pl. 5.* 1828.
Passiflora retusa Hook. Bot. Misc. 3:325. 1833.
Decaloba punctata (L.) M. Roem. Fam. Nat. Syn. 2:156. 1846.
Cieca discolor (Link & Otto) M. Roem. loc. cit. 140. 1846.
Cieca misera (HBK.) M. Roem. loc. cit. 1846.
Passiflora microcarpa Mast. in Mart. Fl. Bras. 13^1:556, 593. 1872.
Passiflora laticaulis Killip, in Journ. Wash Acad. Sci. 14:110. 1924.
Passiflora translinearis Rusby, in Ann. N. Y. Bot. Gard. 7:309. 1927, in part.
Passiflora longilobis Hoehne, in Linh. Telegr. Matto Grosso, Annex. 5: Bot. 1:71. *pl. 63.* 1910.

Slender climbers, glabrous or essentially so. Leaves petiolate, simple, basifixed, much broader than long, with 2 nearly transverse lateral lobes and usually a slender central mucro or rarely a small central lobe, 0.5–3.0 cm. long, 3–10 cm. broad, conspicuously glandular-ocellate; petioles 1–6 cm. long, eglandular; stipules minute and subsetaceous. Inflorescence usually solitary and bearing a single greenish white, occasionally purple-tinged flower, the associated tendril basal; peduncle 3–10 cm. long, jointed almost immediately beneath the flower; bracts inconspicuous and setaceous. Flowers about 2–4 cm. in diameter; sepals ovate-lanceolate, 1–2 cm. long; petals narrowly oblong, 8–12 mm. long; filaments of the corona in 2 series, the outer almost equaling the petals. Fruit globose, 1.0–1.5 cm. in diameter, purple.

Panama to Argentina, at low elevations in thickets and forest clearings.

CANAL ZONE: Barro Colorado Island, *Woodworth & Vestal 457, 717, Bailey & Bailey 258, Kenoyer 456, Wetmore & Abbe 26, Bangham 574, Hunnewell 19029*; Monte Lirio, *Maxon 6841*; between Frijoles and Monte Lirio, *Killip 12187*; Trinidad River, *Pittier 3998*. PANAMÁ: Mindi, *Cowell 169*; Río Mindi, *Sutton Hayes 596*; Baillemona, *Stevens 687*.

It is questionable whether *P. misera* can be maintained as a species distinct from *P. punctata* since their general aspect, variational tendency, and geographical distribution have so very much in common. They were kept separate by Killip, however, who was of the opinion that the inner corona filaments are linear, broadly dilated at the apex and often lobulate in *P. misera* and filiform or capillary, rarely minutely capitellate in *P. punctata*.

8. PASSIFLORA HAHNII (Fourn.) Mast. in Mart. Fl. Bras. 13^1:569. 1872.

Disemma Hahnii Fourn. in Rev. Hort. 41: *pl. 430.* 1869.
Passiflora guatemalensis S. Wats. in Proc. Amer. Acad. 22:473. 1887.

Rather slender climbers, glabrous throughout. Leaves petiolate, simple, very eccentrically peltate, broadly ovate, essentially entire or if 3-lobed the central lobe far stronger and the lateral relatively inconspicuous, the base truncate or broadly rounded, 5–8 cm. long and broad; petioles 2–3 cm. long, eglandular; stipules large and foliaceous, inequilaterally reniform, amplexicaul, ciliate-serrate, about 1 cm. long and 2 cm. broad, deciduous. Inflorescences bearing solitary yellowish-white flowers upon paired or solitary peduncles, the associated tendril basal; peduncles 1.5–2.0 cm. long, jointed almost immediately beneath the flower; bracts minute and subulate. Flowers about 4–6 cm. in diameter; sepals oblong, 2–3 cm. long, not corniculate; petals similar to the sepals; filaments of the corona in 2 series, the outer about 1.5 cm. long. Fruit globose, 3–4 cm. in diameter, deep purple.

Southern Mexico to Colombia, at low to middle elevations.

COCLÉ: mountains beyond La Pintada, 400–600 m., *Hunter & Allen 629*.

9. PASSIFLORA CORIACEA Juss. in Ann. Mus. Hist. Nat. 6:109. *pl. 39, fig. 2.* 1805; Killip, in Field Mus. Publ. Bot. 19:83. 1938.

Passiflora difformis HBK. Nov. Gen. & Sp. 2:136. 1817.
Passiflora clypeata J. E. Sm. in Rees, Cycl. 26: *Passiflora* no. 20. 1819.
Monactineirma coriacea (Juss.) Bory, in Ann. Sci. Gén. Phys. Brux. 2:138. 1819.
Cieca difformis (HBK.) M. Roem. Fam. Nat. Syn. 2:140. 1846.
Cieca coriacea (Juss.) M. Roem. loc. cit. 148. 1846.
Passiflora sexocellata Schlecht. in Linnaea 27:521. 1854.
Passiflora obtusifolia Sessé & Moc. pl. Nov. Hisp. 156. 1887.

Rather extensive climbers inconspicuously puberulent to glabrate. Leaves petiolate, simple, very eccentrically peltate, deeply 3-lobed, the lateral lobes rather abruptly acuminate and nearly transverse, as strong as the central lobe to much stronger, 3–7 cm. long, 6–25 cm. broad; petioles 2–4 cm. long, bearing 2 ocellate glands near the juncture with the leaf blade; stipules narrowly linear, about 0.5 cm. long. Inflorescence a terminal 2- to several-flowered raceme, with slightly foliaceous, frequently 3-lobed bracts subtended by paired ocellate glands; pedicels about 5 mm. long. Flowers 2.5–3.5 cm. in diameter, greenish or yellowish white; sepals oblong-lanceolate, 1.0–1.5 cm. long, not corniculate; petals none; filaments of the corona in 2 series, the outermost 7–8 mm. long. Fruit globose, 1–2 cm. in diameter, deep blue.

Mexico to British Guiana and Bolivia, from near sea level to about 2,000 m.

CANAL ZONE: Cocoli Island, Miraflores Lake, *P. White 86, G. White 133*; Las Cascadas, *Standley 29594*; Darién Station, *Standley 31617;* Empire to Mandinga, *Piper 5479*; Barro Colorado Island, *Shattuck 57, Woodworth & Vestal 501.* COCLÉ: El Valle de Antón, *Allen 1667, 4473.* PANAMÁ: Alhajuela, *Pittier 3456.*

In some parts of Central America this species is known as *murciélago* and *ala de murciélago* with reference to the peculiar shape of the leaves.

10. PASSIFLORA HOLOSERICEA L. Sp. Pl. 958. 1753; Killip, in Field Mus. Publ. Bot. 19:99. 1938.

Decaloba holosericea (L.) M. Roem. Fam. Nat. Syn. 2:164. 1846.

Rather coarse climbers, densely puberulent throughout. Leaves petiolate, simple, basifixed, broadly 3-lobed, the lobes rounded and occasionally mucronulate, the central lobe far stronger, the base rounded to somewhat cordate, 5–10 cm. long, 4–8 cm. broad; petioles 1–3 cm. long, the glands rather inconspicuous and broadly poculiform; stipules inconspicuous and filiform. Inflorescences usually paired, corymbiform, typically bearing 2 or more greenish white or yellow flowers upon a very short common peduncle, the associated tendril basal; common peduncles 2–4 mm. long; pedicels about 1 cm. long; bracts inconspicuous and filiform. Flowers about 2–4 cm. in diameter, sepals oblong-elliptic, about 1.5 cm. long; petals broadly elliptic, about 1 cm. long; filaments of the corona in 2 series, the outer nearly as long as the petals, flushed with yellow and purple. Fruit globose, about 1.5 cm. in diameter.

Southern Mexico to Colombia and Venezuela; Cuba. Lowland thickets to about 700 m.

CHIRIQUÍ: vicinity of Puerto Armuelles, *Woodson & Schery 816.*

11. PASSIFLORA AURICULATA HBK. Nov. Gen. & Sp. 2:131. 1817; Killip, in Field Mus. Publ. Bot. 19:122. 1938.

Passiflora appendiculata G. F. W. Mey. Prim. Fl. Esseq. 223. 1818.
Passiflora cyathophora Desv. in Ham. Prodr. 48. 1825.
Passiflora Rohrii DC. Prodr. 3:326. 1828.
Passiflora cinerea Poepp. & Endl. Nov. Gen. & Sp. 2:57. *pl. 177.* 1838.
Cieca auriculata (HBK.) M. Roem. Fam. Nat. Syn. 2:143. 1846.
Cieca appendiculata (G. F. W. Mey.) M. Roem. loc. cit. 145. 1846.
Cieca cinerea (Poepp. & Endl.) M. Roem. loc. cit. 148. 1846.
Decaloba Rohrii (DC.) M. Roem. loc. cit. 156. 1846.
Decaloba cyathophora (Desv.) M. Roem. loc. cit. 157. 1846.
Passiflora Kegeliana Garcke, in Linnaea 22:60. 1849.
Passiflora torta Mast. in Mart. Fl. Bras. 13^1:548. 1872.
Passiflora cayaponioides Rusby, in Bull. N. Y. Bot. Gard. 8:107. 1912.
Passiflora cryptopetala Hoehne, in Comm. Linh. Telegr. Matto Grosso Ann. Bot. 5:76. *pl. 112.* 1915.

Rather coarse climbers, finely puberulent when young, becoming glabrate. Leaves petiolate, simple, basifixed, broadly ovate to ovate-lanceolate, entire or subentire with the lateral lobes reduced to inconspicuous angles, 4–15 cm. long, 2–10 cm. broad, conspicuously ocellate; petioles 1–3 cm. long, bearing 2 very large and auriculate glands near the base; stipules setaceous, up to about 1 cm. long. Inflorescences in pairs, bearing a single greenish yellow, purple-tinged flower; peduncle about 1 cm. long, jointed above the middle; bracts inconspicuous and setose. Flowers about 2 cm. in diameter, greenish yellow or white and purple-tinged toward the base; sepals narrowly oblong-lanceolate, about 1 cm. long, not corniculate; petals linear, about half as long as the sepals; filaments of the corona in 2 series, the outer about as long as the sepals. Fruit globose, 1.0–1.5 cm. in diameter, greenish yellow.

Nicaragua to Bolivia and Brazil, from about sea level to 1,200 m.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 1202*; Water Valley, *Von Wedel 1703*. CANAL ZONE: Chagres, *Fendler 122*; Gatún, *Sutton Hayes 463*; Agua Clara, Ft. Sherman, *Standley 30949*; Agua Clara Reservoir, *Stevens 595*; Barro Colorado Island, *Standley 41026, Zetek 4364*. DARIÉN: Cana, *Williams 964*.

12. PASSIFLORA PEDICULATA Mast. in Bot. Gaz. 23: 247. 1897; Killip, in Field Mus. Publ. Bot. 19:113. 1938.

Rather coarse climbers, glabrous throughout. Leaves petiolate, simple, basifixed, broadly 3-lobed, the central lobe stronger, more or less deeply cordate at the base, 4–9 cm. long, 5–10 cm. broad, inconspicuously ocellate; petioles 1.5–5.0 cm. long, rather inconspicuously glandular about midway or above; stipules inconspicuous and subsetose. Inflorescences solitary or paired, bearing solitary greenish yellow or white, purple tinged flowers; peduncles about 2–4 cm. long, jointed about midway; bracts inconspicuous and subsetaceous. Flowers about 3 cm. in diameter; sepals oblong-lanceolate, about 1.5 cm. long, not corniculate; petals linear, about 1 cm. long; filaments of the corona in 1 series, somewhat shorter than the petals. Fruit not seen.

Costa Rica and western Panama, near sea level to about 1,500 m.

BOCAS DEL TORO: Water Valley, *Von Wedel 854*.

13. PASSIFLORA SUBEROSA L. Sp. Pl. 958. 1753; Killip, in Field Mus. Publ. Bot. 19:88. 1938.

Passiflora pallida L. loc. cit. 1753.
Passiflora hirsuta L. loc. cit. 958. 1753.
Passiflora minima L. loc. cit. 959. 1753.
Passiflora nigra Jacq. Obs. 2:27. *pl. 46, fig. 3*. 1767.
Passiflora glabra Mill. Gard. Dict. ed. 8. *Passiflora* no. 4. 1768.
Passiflora peltata Cav. Diss. 10:447. *pl. 274*. 1780.
Cieca viridis Medic. Malvenfam. 97. 1787.
Cieca nigra (Jacq.) Medic. loc. cit. 1787.
Passiflora angustifolia Sw. Prodr. 97. 1788.
Passiflora parviflora Sw. loc. cit. 1788
Passiflora heterophylla Dryand. in Ait. Hort. Kew. 3:309. 1789, non Lam.
Passiflora hederaefolia Lam. Encycl. 3:38. 1789.
Passiflora longifolia Lam. loc. cit. 40. 1789.
Passiflora hederacea Cav. Diss. 10:448. 1790.
Granadilla suberosa (L.) Gaertn. Fruct. & Sem. 2:480. 1791.
Cieca heterophylla (Dryand.) Moench, Method. Suppl. 101. 1802.
Cieca suberosa (L.) Moench, loc. cit. 102. 1802.
Cieca minima (L.) Moench, loc. cit. 1802.
Passiflora litoralis HBK. Nov. Gen. & Sp. 2:138. 1817.
Baldwinia peltata (Cav.) Raf. Amer. Monthly Mag. 267. 1817.
Monactineirma angustifolia (Sw.) Bory, in Ann. Gén. Sci. Phys. Brux. 2:138. 1819.
Monactineirma minima (L.) Bory, loc. cit. 1819.
Monactineirma suberosa (L.) Bory, loc. cit. 1819.
Monactineirma peltata (Cav.) Bory, loc. cit. 1819.
Monactineirma hederacea (Cav.) Bory, loc. cit. 1819.
Passiflora oliviformis Vell. Fl. Flum. 9: *pl. 83*. 1827.

Passiflora globosa Vell. loc. cit. *pl. 85.* 1827.
Passiflora Kohautiana Presl, Fl. Bemerk. 72. 1836.
Passiflora villosa Macfad. Fl. Jam. 2:151. 1837, non Vell.
Meioperis peltata (Cav.) Raf. Fl. Tellur. 4:103. 1838.
Meioperis suberosa (L). Raf. loc. cit. 1838.
Meioperis minima (L.) Raf. loc. cit. 1838.
Meioperis pallida (L.) Raf. loc. cit. 1838.
Meioperis angustifolia (Sw.) Raf. loc. cit. 1838.
Meioperis hederacea (Cav.) Raf. loc. cit. 1838.
Passiflora Warei Nutt. in Silliman's Journ. ex Torr. & Gray, Fl. N. Amer. 1:539. 1838.
Passiflora limbata Tenore, Ind. Sem. Hort. Neapol. 12: 1839.
Passiflora flexuosa Gardn. in Lond. Journ. Bot. 1:174. 1842.
Passiflora pseudo-suberosa Fisch. Ind. Sem. Hort. Bot. Petropol. 9:82, ex Walp. Rep. 2:934. 1843.
Cieca peltata (Cav.) M. Roem. Fam. Nat. Syn. 2:141. 1846.
Cieca hederacea (Cav.) M. Roem. loc. cit. 1846.
Cieca pallida (L.) M. Roem. loc. cit. 1846.
Cieca angustifolia (Sw.) M. Roem. loc. cit. 143. 1846.
Cieca olivaeformis (Mill.) M. Roem. loc. cit. 144. 1846.
Cieca globosa (Vell.) M. Roem. loc. cit. 1846.
Cieca litoralis (HBK.) M. Roem. loc. cit. 145. 1846.
Cieca pseudo-suberosa (Fisch.) M. Roem. loc. cit. 146. 1846.
Cieca Warei (Nutt.) M. Roem. loc. cit. 1846.
Cieca minima (L.) M. Roem. loc. cit. 147. 1846.
Cieca flexuosa (Gardn.) M. Roem. loc. cit. 148. 1846.
Cieca limbata (Tenore) M. Roem. loc. cit. 1846.
Passiflora lineariloba Hook. f. in Trans. Linn. Soc. 20:222. 1851.
Passiflora tridactylites Hook. f. loc. cit. 1851.
Passiflora puberula Hook. f. loc. cit. 223. 1851.
Passiflora suberosa var. *divaricata* Griseb. in Bonplandia 6:7. 1858.
Passiflora suberosa var. *minima* (L.) Mast. in Trans. Linn. Soc. 27:630. 1871.
Passiflora suberosa var. *hirsuta* (L.) Mast. loc. cit. 1871.
Passiflora suberosa var. *angustifolia* (Sw.) Mast. loc. cit. 1871.
Passiflora suberosa var. *pallida* (L.) Mast. loc. cit. 1871.
Passiflora suberosa var. *hederacea* (Cav.) Mast. loc. cit. 1871.
Passiflora suberosa var. *lineariloba* (Hook. f.) Mast. in Mart. Fl. Bras. 13^1:579. 1872.
Passiflora suberosa var. *longiloba* Tr. & Planch. in Ann. Sci. Nat. V. Bot. 17:157. 1873.
Passiflora suberosa var. *longipes* S. Wats. in Proc. Amer. Acad. 25:149. 1890.
Passiflora calliaquatica Krause, in Bot. Centralbl. Beih. 32^2:340. 1914.

Slender climbers, glabrous to densely puberulent, the base of the stems more or less corky. Leaves petiolate, simple, basifixed, extremely variable, usually definitely 3-lobed, the central lobe longer, rarely almost entire 3–12 cm. long, 2–9 cm. broad, not ocellate or very inconspicuously so; petioles 1–2 cm. long, inconspicuously glandular near the juncture with the leaf blade; stipules inconspicuous and linear. Inflorescences usually paired, each bearing a single small, greenish flower; peduncles filiform, 1–2 cm. long, jointed almost directly beneath the flower; bracts very minute. Flowers about 1–3 cm. in diameter; sepals lanceolate, 0.5–1.5 cm. long, not corniculate; petals absent; filaments of the corona in 2 series, the outer about half as long as the sepals. Fruit globose, deep purple, 0.5–1.5 cm. in diameter.

Peninsular Florida and southern Texas; Mexico to Brazil and Argentina; Bahamas; Antilles; introduced in the Old World tropics. Lowland thickets. *Meloncillo*; ***huevo de gallo.***

PANAMÁ: Bella Vista, *Standley 25357, Killip 12039*; Nuevo San Francisco, *Standley 30733*. SAN BLAS: Puerto Obaldía, *Pittier 4402*.

The preposterous bibliography testifies to the ubiquity and variability of *P. suberosa*. It is odd that it has been so infrequently collected in Panama.

14. PASSIFLORA PULCHELLA HBK. Nov. Gen. & Sp. 2:134. 1817.

Passiflora bicornis Mill. Gard. Dict. ed. 8. *Passiflora* no. 13. 1768.
Passiflora rotundifolia Jacq. Obs. 2:26. *pl. 46, fig. 1.* 1767, non L.
Passiflora rotundifolia var. *Jacquinii* DC. Prodr. 3:326. 1828.
Decaloba Jacquini (DC.) M. Roem. Fam. Nat. Syn. 2:156. 1846.
Passiflora divaricata Griseb. in Bonplandia 6:7. 1858.
Passiflora pulchella var. *bifidata* Mast. in Engl. Bot. Jahrb. 8:220. 1887.

Rather stout climbers, glabrous throughout. Leaves rather long-petiolate, simple, basifixed, broadly and cuneately 2-lobed, occasionally with a small central lobe, 2–6 cm. long, 3–9 cm. broad, rather inconspicuously glandular-ocellate; petioles 1–3 cm. long, not glandular; stipules linear, 5–10 mm. long. Inflorescences solitary or rarely paired in the axils of the greatly reduced uppermost leaves, bearing solitary involucrate blue or lavender flowers, the associated tendrils basal; peduncles 5–8 cm. long, jointed directly beneath the flower; bracts conspicuously involucrate, broadly obovate, cuneate at the base, entire, 1.0–1.5 cm. long, pale green occasionally tinged with purple. Flowers about 4–6 cm. in diameter; sepals oblong, about 2 cm. long, not corniculate; petals ovate-lanceolate, about 1.5 cm. long; filaments of the corona in several series, the outer about as long as the petals. Fruit globose, about 1 cm. in diameter.

Southern Mexico to Colombia and Venezuela; cultivated in Hawaii. Thickets near sea level.

CANAL ZONE: Fort Kobe Road, *Woodson, Allen & Seibert 1421*. PANAMÁ: Bella Vista, *Killip 12028, Bro. Heriberto 218*; Las Sabanas, *Standley 40781*.

This is one of the showiest Panamanian passionflowers because the flowers, although not large, are borne in the very characteristic raceme-like clusters at the tips of the stems.

15. PASSIFLORA MEMBRANACEA Benth. Pl. Hartw. 83. 1841; Killip, in Field Mus. Publ. Bot. 19:234. 1938.

Cieca membranacea (Benth.) M. Roem. Fam. Nat. Syn. 2:140. 1841.

Rather stout climbers, glabrous throughout. Leaves rather shortly petiolate, simple, barely peltate, suborbicular and very indistinctly 3-lobed, the tip and lateral lobes mucronulate, 5–10 cm. long and about as broad; petioles 2–3 cm. long, eglandular; stipules conspicuously foliaceous, deeply cordate-reniform and strongly amplexicaul, 1.5–3.0 cm. broad. Inflorescences solitary at the nodes, bearing a single very strikingly involucrate greenish white or cream flower; peduncles 10–15 cm. long, jointed almost immediately beneath the flower; bracts very broadly ovate or suborbicular, very deeply cordate, 4–5 cm. long and broad, pale green strongly suffused with rose. Flowers about 7–8 cm. in diameter; sepals oblong-lanceolate,

about 4 cm. long, not corniculate; petals oblong-elliptic, about as long as the sepals; filaments of the corona in 2 series, the outer about 1 cm. long. Fruits oblong-ovoid, tapered at the base, 4–6 cm. long and 2–3 cm. thick, yellowish green.

Southern Mexico to Panama, in highland forests.

CHIRIQUÍ: Potrero Muleto to summit, Volcán de Chiriquí, *Woodson & Schery 389*; "New Switzerland", central valley of Río Chiriquí Viejo, *Allen 1394*.

This is one of the most distinctive and attractive species of the genus by virtue of the elongate peduncles and large petalaceous bracts which almost equal the flowers.

16. PASSIFLORA ADENOPODA DC. Prodr. 3:330. 1828; Killip, in Field Mus. Publ. Bot. 19:222. 1938.

Passiflora acerifolia Schlecht. & Cham. in Linnaea 5:89. 1830.
Dysosmia acerifolia (Schlecht. & Cham.) M. Roem. Fam. Nat. Syn. 2:151. 1846.
Ceratosepalum micranthum Oerst. Amér. Centr. *pl. 17*. 1863.
Passiflora ceratosepala Mast. in Trans. Linn. Soc. 27:630. 1871.
Passiflora aspera Sessé & Moc. Fl. Mex. 227. 1887.

Coarse climbers, minutely hispidulous to glabrate. Leaves long-petiolate, basifixed, deeply (3-)5- to 7-lobed, the central and upper lobes stronger, acuminate, deeply cordate, 7–15 cm. long, 8–17 cm. broad, membranaceous, hispidulous to glabrate; petioles 3–8 cm. long, bearing 2 very large prominently stipitate glands near the juncture with the leaf blade; stipules broadly ovate, amplexicaul, denticulate, 1.0–1.5 cm. long and broad, foliaceous, persistent. Inflorescences paired, bearing a single large purple and white flower; peduncle 3–4 cm. long, jointed somewhat below the middle and there bearing 3 lacerate subfoliaceous bracts about 1 cm. long. Flowers about 4–7 cm. in diameter; sepals oblong-lanceolate, 3–4 cm. long, prominently corniculate at the tip; petals narrowly lanceolate, 1.0–1.5 cm. long; filaments of the corona in a single series, about as long as the petals or slightly longer. Fruit globose, 2.0–2.5 cm. in diameter, greenish yellow, densely puberulent.

Southern Mexico to Venezuela and Peru at middle to higher elevations.

CHIRIQUÍ: El Boquete, *Seemann 1626*.

The Seeman collection was found by Killip at both Kew and the British Museum; it was not examined for the present account.

17. PASSIFLORA VITIFOLIA HBK. Nov. Gen. & Sp. 2:138. 1817, Killip, in Field Mus. Publ. Bot. 19:319. 1938.

Passiflora sanguinea J. E. Sm. in Rees, Cycl. 26: *Passiflora* no. 45. 1819.
Passiflora punicea R. & P. ex DC. Prodr. 3:329. 1828.
Tacsonia sanguinea (J. E. Sm.) DC. loc. cit. 334. 1828.
Macrophora sanguinea (J. E. Sm.) Raf. Fl. Tellur. 4:103. 1838.
Passiflora serrulata var. *pubescens* Griseb. in Bonplandia 6:7. 1858.
Passiflora servitensis Karst. in Linnaea 30:163. 1859.
Tacsonia Buchanani Lem. Ill. Hort. 14: *pl. 519*. 1867.

Rather coarse climbers, more or less densely ferruginous-pubescent throughout.

Leaves petiolate, basifixed, rather inconspicuously serrulate, deeply 3-lobed, the central lobe stronger, more or less deeply cordate, 7–15 cm. long, 8–17 cm. broad; petioles 2–6 cm. long, bearing 2 to several rather inconspicuous glands toward the base; stipules subsetaceous, 3–5 mm. long. Inflorescences solitary, bearing a single very showy yellow and scarlet flower; peduncle 4–8 cm. long, jointed almost directly beneath the flower; bracts conspicuous and foliaceous or somewhat petaloid, lanceolate, glandular-serrate to nearly entire, 1.5–2.5 cm. long. Flowers 10–15 cm. in diameter; sepals about 6–10 cm. long, corniculate; petals narrowly lanceolate, nearly as long as the sepals; filaments of the corona in 3 series, the outer 1.5–2.0 cm. long. Fruits broadly ovoid, 3–6 cm. long, greenish yellow, densely puberulent.

Nicaragua to Venezuela and Peru; Cuba and Jamaica; in lowland forests. Known as *guate-guate* and *pasionaria* in Panama.

CANAL ZONE: Las Cruces Trail, *Hunter & Allen 456*; Barro Colorado Island, *Wetmore & Abbe 76*; between Summit and Gamboa, *Greenman & Greenman 5220*; Chagres, *Fendler 118*. CHIRIQUÍ: San Bartolomé, *Woodson & Schery 871*. COCLÉ: mountains beyond La Pintada, *Hunter & Allen 558*; El Valle de Antón, *Allen 1660*. COLÓN: Camp Piña, *Allen 3431*. DARIÉN: Marragantí, *Williams 1150*; Chepigana, *Terry & Terry 1374*; Río Sabana, *Leopold III 126*. PANAMÁ: Tapia River, Juan Díaz region, *Maxon & Harvey 6733, 6678, 6683, Standley 28101*; Tecumen River, *Killip 3313*; Orange River, *Killip 3335*; Pacora, *Bro. Paul 292*.

The dazzling flowers of *P. vitifolia* are frequent and widespread in lowland thickets and open forests throughout the Republic.

18. PASSIFLORA WILLIAMSII Killip, in Journ. Wash. Acad. Sci. 12:262. 1922; in Field Mus. Publ. Bot. 19:355. 1938.

Coarse climbers, softly and densely puberulent throughout. Leaves petiolate, basifixed, deeply 3-lobed to somewhat below the middle, the central lobe stronger and somewhat contracted toward the base, inconspicuously serrulate, 8–15 cm. long, 9–16 cm. broad; petioles 4–6 cm. long, with 2–3 ocellate glands toward the base; stipules filiform, inconspicuous. Inflorescences solitary, bearing a single handsome violet flower; peduncle 1.0–1.5 cm. long, jointed directly beneath the flower; bracts involucrate, united toward the base and completely enveloping the flower before anthesis, 2.5–3.5 cm. long, densely puberulent, pale green. Flowers about 6–7 cm. in diameter; sepals oblong, 3–4 cm. long; petals oblong-spatulate, 2.0–2.5 cm. long; filaments of the corona in several series, the outermost less than half as long as the petals. Fruits unknown.

Known only from Panama, at middle and low elevations.

CANAL ZONE: between Empire and Mandinga, *Piper 5481*; Barro Colorado Island, *Zetek 4352*. COCLÉ: Bismarck, above Penonomé, *Williams 585*. PANAMÁ: Las Sabanas, *Bro. Paul 308*.

This species bears 4 rather conspicuous ocellate glands upon the leaf blade, on each lobe toward the base of the two sinuses; the central lobe thus with two glands, the lateral with one apiece.

19. PASSIFLORA MENISPERMIFOLIA HBK. Nov. Gen. & Sp. 2:137. 1817; Killip, in Field Mus. Publ. Bot. 19:457. 1938.

Passiflora villosa Dombey, ex Triana & Planch. in Ann. Sci. Nat. ser. 5. 17:154. 1873, in synon.

Rather coarse climbers, more or less densely pilose to glabrate throughout. Leaves petiolate, basifixed, broadly 3-lobed to somewhat above the middle, the central lobe much stronger, usually inconspicuously serrulate toward the cordate base, 7–15 cm. long, 5–13 cm. broad; petioles 2–5 cm. long, with 2 to several pairs of slender stipitate glands; stipules conspicuously foliaceous, ovate-subreniform, deeply amplexicaul, 1.5–3.5 cm. long, glandular-denticulate to subentire. Inflorescences solitary, bearing a single white and purple flower; peduncle 4–6 cm. long, jointed directly below the flower; bracts rather narrowly lanceolate, 1–2 cm. long, foliaceous, with rather few glandular denticulations to entire. Flowers about 6 cm. in diameter; sepals narrowly oblong, 2–3 cm. long, corniculate; petals linear-oblong, about equaling the sepals; filaments of the corona in several series, the outermost about half as long as the petals. Fruits broadly ovoid, 4–6 cm. long.

Nicaragua to Peru and northern Brazil, from near sea level to about 1500 m.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 434, 1195, 1406.* CANAL ZONE: Madden Dam, *Allen 2007*; Gatuncillo, *Piper 5623*; Barro Colorado Island, *Woodworth & Vestal 637.* CHIRIQUÍ: Boquete, *Terry 1281.* VERAGUAS: Soná, *Woodson, Seibert & Allen 515.*

20. PASSIFLORA SUBPELTATA Ortega, Nov. Rar. Pl. Hort. Matrit. 6:78. 1789; Killip, in Field Mus. Publ. Bot. 19:436. 1938.

Passiflora alba Link & Otto, Icon. Pl. Rar. 65. *pl. 33.* 1828.
Passiflora adenophylla Mast. in Mart. Fl. Bras. 13^1:568. 1872.
Passiflora atomaria Planch. ex Mast. loc. cit. 570. 1872.

Rather slender climbers, glabrous throughout. Leaves shortly petiolate, basifixed, very broadly 3-lobed to about the middle, the 3 lobes subequal, rounded, with 2–3 pairs of inconspicuous serrulate glands in the sinuses, rounded to subcordate at the base, 4–9 cm. long, 5–12 cm. broad; petioles 2–6 cm. long, with 1 pair of inconspicuous glands at about the middle; stipules conspicuously foliaceous, broadly ovate, 1–4 cm. long and about half as broad. Inflorescences solitary, bearing a single purple and white flower; peduncle 2–5 cm. long, jointed directly beneath the flower; bracts conspicuously involucrate, broadly ovate, about 1.0–1.5 cm. long and broad, abruptly acuminate, pale green somewhat tinged with rose. Flowers about 5–7 cm. in diameter; sepals oblong, about 3 cm. long, very conspicuously corniculate; petals narrowly lanceolate, 2.0–2.5 cm. long; filaments of the corona in several series, the outermost about equaling the petals. Fruits subglobose, 3–4 cm. in diameter.

Mexico to Venezuela and Colombia, near sea level to about 2,800 m., in thickets and open forest.

CANAL ZONE: Miraflores, *White & White 45*; Red Tank, *Maxon 6574.* PANAMÁ: Juan Díaz, *Standley 32051*; Taboga Island, *Standley 27971.*

21. PASSIFLORA LIGULARIS Juss. in Ann. Mus. Hist. Nat. 6:113. *pl. 40.* 1805; Killip, in Field Mus. Publ. Bot. 19:344. 1938.

Passiflora serratistipula DC. Prodr. 3:328. 1828.

Rather stout climbers, glabrous throughout. Leaves long-petiolate, basifixed, entire, broadly ovate, deeply cordate, abruptly subcaudate-acuminate, 8–17 cm. long, 6–15 cm. broad; petioles 5–15 cm. long, with 3–5 pairs of elongate filiform glands; stipules foliaceous, ovate, 1–3 cm. long. Inflorescences solitary, bearing a single showy pale green, purple- and lavender-tinged flower; peduncles 2–5 cm. long, jointed directly beneath the flower; bracts involucrate and foliaceous, ovate, 2–4 cm. long. Flowers about 7–9 cm. in diameter; sepals oblong, 3–5 cm. long; petals narrowly lanceolate, 3–4 cm. long; filaments of the corona in several series, the outermost about as long as the petals. Fruits broadly ovoid, 6–8 cm. long, purplish yellow.

Southern Mexico to Venezuela and Bolivia, in highland forests between 1,000 and 3,000 m.

CHIRIQUÍ: vicinity of Finca Lérida, *Woodson & Schery 238.*

22. PASSIFLORA QUADRANGULARIS L. Syst. Nat. 1248. 1759; Killip, in Field Mus. Publ. Bot. 19:335. 1938.

Granadilla quadrangularis (L.) Medic. Malvenfam. 97. 1787.
Passiflora tetragona M. Roem. Fam. Nat. Syn. 2:165. 1846.
Passiflora macroceps Mast. in Gard. Chron. 1869:1012. 1869.

Coarse climbers with prominently winged stems, glabrous throughout. Leaves petiolate, basifixed, entire, broadly ovate, abruptly and shortly acuminate, rounded at the base to broadly cordate, 10–20 cm. long, 8–15 cm. wide; petioles 2–5 cm. long, with about 3 pairs of ovoid glands; stipules foliaceous, ovate, acuminate, 2–4 cm. long. Inflorescences solitary, bearing a single greenish white flower flushed with rose or purple; peduncles 1.5–3.0 cm. long, jointed directly beneath the flower; bracts delicately foliaceous, broadly ovate, cordate, entire or essentially so, 2–4 cm. long and about as broad. Flowers about 8–12 cm. in diameter; sepals broadly oblong, conspicuously corniculate, 4–5 cm. long; petals ovate-lanceolate, 3–5 cm. long; filaments of the corona in 5 series, about equaling the petals. Fruits broadly oblongoid, up to 3 dm. long, pale yellow somewhat flushed with rose.

Widely cultivated and escaping throughout tropical America; of uncertain origin.

CANAL ZONE: Chagres, *Fendler 119.* PANAMÁ: Juan Díaz, *Standley 32057.*

This is one of the most popular edible passionfruits, and is popularly known as *granadilla* throughout its range in Spanish America and *maracujá* in Brazil. It has a rather insipid fruity flavor of indefinite quality, and although capable of being eaten out of hand it usually is made into a conserve or a thin pudding after boiling in milk.

23. PASSIFLORA OERSTEDII Mast. in Mart. Fl. Bras. 13[1]:562. 1872; Killip, in Field Mus. Publ. Bot. 19:418. 1938.

Passiflora populifolia Triana & Planch. in Ann. Sci. Nat. ser. 5. 17:150. 1873.
Passiflora Purpusii Killip, in Journ. Wash. Acad. Sci. 12:261. 1922.
Passiflora dispar Killip, loc. cit. 330. 1922.

Rather slender climbers, glabrous throughout. Leaves rather shortly petiolate, basifixed, entire, ovate or oblong-ovate, acuminate, rounded to deeply cordate at the base, 6–13 cm. long, 3–9 cm. broad; petioles 1–3 cm. long, bearing several pairs of small stipitate glands; stipules conspicuously foliaceous, strongly inequilateral, narrowly ovate, caudate-cuspidate, entire, 1–4 cm. long. Inflorescences solitary, bearing a single showy purple or lavender-rose flower; peduncles 3–6 cm. long, jointed directly beneath the flower; bracts delicately foliaceous, ovate, rounded or cordate at the base, 1.0–1.5 cm. long. Flowers about 6–8 cm. in diameter; sepals ovate-lanceolate, 3–4 cm. long, conspicuously corniculate; petals linear-oblanceolate, about 1.5 cm. long; filaments of the corona in many series, the outermost equaling the petals or somewhat longer. Fruits broadly ovoid, 4–6 cm. long.

Fig. 2. *Passiflora oerstedii*

Southern Mexico to Colombia and Venezuela, from near sea level to about 1500 m., in open forest.

BOCAS DEL TORO: Water Valley, *Von Wedel 1756*. COCLÉ: La Mesa, north of El Valle de Antón, *Allen 2399*. CHIRIQUÍ: Bajo Mona and Quebrada Chiquero, *Woodson & Schery 591*; Volcán de Chiriquí, *Terry 1303*.

24. PASSIFLORA AMBIGUA Hemsl. in Curt. Bot. Mag. *pl. 7822*. 1902; Killip, in Field Mus. Publ. Bot. 19:363. 1938.

Rather coarse climbers, glabrous throughout or essentially so. Leaves petiolate, basifixed, entire, ovate to oblong-elliptic, acuminate, obtuse or rounded at the base, 10–20 cm. long, 5–9 cm. broad, rather thickly coriaceous; petioles 2–3 cm. long, bearing 2 thick ocellate glands toward the base; stipules filiform, relatively inconspicuous. Inflorescences solitary, bearing a single showy maroon, rose, or purple flower; peduncles 5–7 cm. long, jointed directly beneath the flower; bracts free, ovate, 3–6 cm. long, delicately subfoliaceous or somewhat petalaceous. Flowers 8–12 cm. in diameter; sepals narrowly oblong, 4–6 cm. long, rather inconspicuously corniculate; petals narrowly lanceolate, 3–4 cm. long; filaments of the corona in several series, the outermost about half as long as the petals. Fruits broadly ovoid, 10–12 cm. long, greenish yellow.

Southern Mexico to Panama, from near sea level to about 1000 m., in thickets and open forest.

BOCAS DEL TORO: Fish Creek Mountains, *Von Wedel 2324*; Columbus Island, *Von Wedel 80*. CANAL ZONE: Gatún, *Sutton Hayes 430*; Barro Colorado Island, *Bangham 466*. COCLÉ: north rim of El Valle de Antón, *Allen 1686*.

25. PASSIFLORA NITIDA HBK. Nov. Gen. & Sp. 2:130. 1817; Killip, in Field Mus. Publ. Bot. 19:374. 1938.

Passiflora nymphaeoides Karst. in Linnaea 30:165. 1859.

Rather coarse climbers, glabrous throughout. Leaves rather shortly petiolate, basifixed, rather distantly serrate or serrulate, at least toward the base, broadly elliptic to lanceolate, abruptly acuminate, rounded at the base, 9–18 cm. long, 6–10 cm. broad, subcoriaceous; petioles 1.0–1.5 cm. long, with 2 large ovoid glands somewhat above the middle; stipules inconspicuous and filiform. Inflorescences solitary, bearing a single showy white and purple flower; peduncles 3–6 cm. long, jointed directly beneath the flower; bracts free, ovate, entire, 3–4 cm. long, foliaceous or somewhat petalaceous. Flowers 8–9 cm. in diameter; sepals oblong-elliptic, 4.0–4.5 cm. long, inconspicuously corniculate; petals about as long as the sepals; filaments of the corona in several series, the outermost about half as long as the petals. Fruits obovoid, 4–6 cm. long.

Panama to northern Brazil and adjacent Peru, in lowland thickets and open forests.

CANAL ZONE: Barro Colorado Island, *Shattuck 675*; Summit, *Lindsay 230*.

26. PASSIFLORA SEEMANNII Griseb. in Bonplandia 6:7. 1858; Killip, in Field Mus. Publ. Bot. 19:347. 1938.

Passiflora incana Seemann, ex Mast. in Journ. Linn. Soc. 20:40. 1883, non Kerr, in synon.
Passiflora orbifolia Planch. & Linden, in Ann. Sci. Nat. ser. 5. 17:150. 1873.

Rather stout climbers, glabrous throughout. Leaves petiolate, basifixed, entire, broadly cordate-ovate, abruptly and shortly apiculate-acuminate, 5–10 cm. long, 5–7 cm. broad; petioles 3–7 cm. long, with 2 rather inconspicuous sessile glands directly below the leaf blade; stipules linear, about 1 cm. long. Inflorescences

solitary, bearing a single handsome white or cream flower strongly suffused with purple or violet; peduncles 6–10 cm. long, jointed directly below the flower; bracts more or less petalaceous, united at the base and completely enveloping the flower before anthesis, 3–5 cm. long. Flowers about 8–10 cm. in diameter; sepals narrowly ovate, 4–5 cm. long, rather inconspicuously corniculate; petals oblong-lanceolate, 3–4 cm. long; filaments of the corona in 2 series, the outer about 1 cm. long. Fruits ovoid, 3–5 cm. long and broad.

Southern Mexico to Colombia, at near sea level to about 1,500 m.

BOCAS DEL TORO: Lincoln Creek, Río Changuinola, *Dunlap 422*; vicinity of Chiriquí Lagoon, *Von Wedel 1260, 1366*; Water Valley, *Von Wedel 1679*. CANAL ZONE: Bohio, *Maxon 4765*; Gamboa, *Pittier 2515, Allen 3930*; between Summit and Gamboa, *Greenman & Greenman 5221*; Gatún, *Bro. Heriberto 53*; between Mt. Hope and Sta. Rita Trail, *Cowell 59*; Las Cascadas, near Summit, *Standley 29566*; East Paraíso, *Standley 29838*; Quebrada Culebra, *Dodge & Allen 17048*; Las Cruces Trail, *Hunter s. n.*; Chagres, *Fendler 120*; Miraflores, *White & White 42*. COLÓN: between France Field and Cativa1, *Standley 30286*. DARIÉN: Tucute, Chepigana District, *Terry & Terry 1393*. PANAMÁ: hills above Campana, *Allen 1694*; Tapia River, *Maxon & Harvey 6730, Standley 28179, Killip 3297*; Juan Díaz, *Standley 30634*.

This handsome species has been introduced into cultivation in Mexico, Nicaragua, and Hawaii, according to Killip. According to Killip also, the leaves occasionally are lobed, but those of all the specimens cited above are entire.

27. PASSIFLORA FOETIDA L. Sp. Pl. 959. 1753; Killip, in Field Mus. Publ. Bot. 19:481. 1938.

Passiflora vesicaria L. Amoen. Acad. 5:382. 1760.
Passiflora hibiscifolia Lam. Encycl. 3:39. 1789.
Passiflora ciliata Dryand. in Ait. Hort. Kew. 3:310. 1789.
Granadilla foetida (L.) Gaertn. f. Fruct. & Sem. 1:289. 1790.
Passiflora gossypifolia Desv. in Hamilt. Prodr. Fl. W. I. 48. 1825.
Tripsilina foetida (L.) Raf. Fl. Tellur. 4:103. 1838 (as *fetida*).
Passiflora nigelliflora Hook. Bot. Mag. *pl. 3635*. 1839.
Passiflora hastata Bertol. Fl. Guat. 427. 1840.
Dysosmia foetida (L.) M. Roem. Fam. Nat. Syn. 2:149. 1846.
Dysosmia gossypiifolia (Desv.) M. Roem. loc. cit. 1846.
Dysosmia hastata (Bertol.) M. Roem. loc. cit. 1846.
Dysosmia hibiscifolia (Lam.) M. Roem. loc. cit. 1846.
Dysosmia ciliata (Dryand.) M. Roem. loc. cit. 1846.
Dysosmia fluminensis M. Roem. loc. cit. 150. 1846.
Dysosmia nigelliflora (Hook.) M. Roem. loc. cit. 151. 1846.
Passiflora Baraquiniana Lem. in Illustr. Hort. 8: *pl. 276*. 1861.
Passiflora Liebmanni Mast. in Mart. Fl. Bras. 13^1:547. 1872.
Passiflora hispida DC. ex Triana & Planch. in Ann. Sci. Nat. ser. 5. 17:172. 1873.
Passiflora Moritziana Planch. loc. cit. 175. 1873.
Passiflora muralis Barb. Rodr. in Contr. Jard. Bot. Rio Jan. 1:29. 1891.
Passiflora Balansae Chod. in Bull. Herb. Boiss. ser. 2. 2:744. 1902.
Passiflora pseudociliata Britton, in Bull. Torrey Bot. Club 44:19. 1917.
(Also very numerous varietal and formal designations).

Rather slender climbers, commonly more or less yellow-pubescent throughout, less frequently glabrate or glabrous. Leaves petiolate, basifixed, extremely variable, in Panama chiefly broadly and acutely 3-lobed to about the middle, the central lobe

far stronger, usually about 4–12 cm. long and wide; petioles usually about 2–6 cm. long, usually beset with mixed glandular and eglandular hairs; stipules subsetaceous, inconspicuous. Inflorescences solitary, bearing a single greenish white or yellow, more or less purple-tinged flower; peduncles 3–7 cm. long, jointed directly beneath the flower; bracts foliaceous, complexly 2- or 3-pinnatifid, each filiform division gland-tipped, usually 2–4 cm. long. Flowers about 4–6 cm. in diameter; sepals oblong-lanceolate, about 2–3 cm. long, shortly corniculate; petals oblong-oblanceolate, slightly shorter than the sepals; filaments of the corona in several series, the outermost about 1 cm. long. Fruits subglobose, yellow or orange, about 2–3 cm. in diameter.

Common throughout tropical America in lowland thickets and open forest, becoming a weed.

BOCAS DEL TORO: Old Bank Island, *Von Wedel 2142*; Water Valley, *Von Wedel 1718, 1831*; vicinity of Chiriquí Lagoon, *Von Wedel 1562*. CANAL ZONE: Las Cruces Trail, *Hunter & Allen 724*; near mouth of Río Chagres, *Allen 899*; Chagres, *Fendler 117*; Ft. San Lorenzo, *Maxon & Valentine 7013*; Matías Hernández, *Pittier 6954*; Gatún Station, *Sutton Hayes 597*; Ahorca Lagarto to Culebra, *Cowell 393*; valley of Masambí, *Pittier 2678*; Río Grande, near Culebra, *Pittier 2089*. CHIRIQUÍ: llanos west of Gualaca, *Allen 5048*. COLÓN: Porto Bello, *Pittier 2474*. DARIÉN: trail between Pinogana and Yavisa, *Allen 292*. PANAMÁ: Taboga Island, *Miller 2042, Pittier 3569*; Tapía River, *Maxon 6719*.

Passiflora foetida must be frequent at low elevations in every province of Panama. The species, although unmistakable, is extremely variable in small details, and Killip recognized no less than 42 named varieties. All of the specimens enumerated above he referred to var. *isthmia* Killip.

CARICACEAE

Soft-wooded laticiferous shrubs and small trees, usually dioecious or monoecious and with disproportionately thick, simple or infrequently branching trunks ornamented with large leaf scars. Leaves spiral, usually quite large and long-petiolate, exstipulate, the blade palmately compound or simple and variously lobed, rarely entire. Inflorescence axillary at the uppermost nodes, the staminate an extensive and highly compound thyrse, the pistillate much less compounded and with fewer and larger flowers, the fruits developed at the base of the young growth and appearing cauliflorous. Flowers dichlamydeous, 5-merous, regular, hypogynous, sympetalous but usually imperfectly so in the pistillate; calyx lobes 5, imbricate or nearly open in aestivation, usually inconspicuous; corolla salverform or infundibuliform and with a well-developed tube in the staminate, more or less campanulate and rather imperfectly sympetalous in the pistillate, the limb 5-lobed with contorted aestivation; stamens 10 in 2 whorls inserted near the orifice of the corolla tube, the antepetalous usually with somewhat shorter filaments than the antesepalous, the filaments occasionally more or less petaloid or with petaloid appendages, reduced to staminodia or absent in pistillate flowers; pistil superior, 3- to 5-carpellate, usually 1-celled and with parietal placentation, rarely 3- to 5-celled

and with axile placentation, the ovules numerous, anatropous, the stigmas 3–5, sessile or essentially so, usually dichotomous, rarely subcapitate, reduced to an acicular pistillode or absent in staminate flowers. Fruit a very large to rather small succulent 1- to 5-celled berry, the numerous seeds with pulpy testas and funicles.

The Caricaceae are a small family of four genera, all tropical American except the bitypic *Cylicomorpha* of Africa. The plants are of strikingly antediluvian aspect with their stout, usually simple trunks heavily ornamented with large spiral leaf scars and their terminal crowns of fern-like leaves. The latex tubes, which traverse all parts of the plant, are associated with various proteolytic enzymes, particularly papain.

a. Leaves palmately compound; petals antesepalous; ovary 5-celled..... 1. JACARATIA
aa. Leaves palmately lobed; petals alternisepalous; ovary 1-celled..... 2. CARICA

1. JACARATIA Marcgr. ex Endl.

JACARATIA Marcgr. ex Endl. Gen. 933. 1839 (as *Jaracatia*).

Pileus Ramirez, in An. Inst. Med. Nac. Mex. 5:29. 1901.

Dioecious shrubs and trees, branching rather frequently for the family, the trunk becoming very thick. Leaves palmately compound, with 3–12 petiolulate, entire or undulate leaflets. Inflorescences in the axils of the uppermost leaves, thyrsiflorous, the staminate extensive and many flowered, the pistillate reduced and with few larger flowers. Calyx 5-lobed, inconspicuous. Corolla salverform or narrowly infundibuliform, the limb 5-lobed, antesepalous. Stamens 10, the filaments and connectives more or less conspicuously petaloid. Ovary 5-celled, containing numerous ovules on axile placentas. Berry usually rather elongate, 5-celled.

Probably about a dozen species extending from Mexico to Paraguay.

a. Stems unarmed; leaflets 3–5, green beneath..... 1. J. DOLICHAULA
aa. Stems armed with conspicuous spines; leaflets 5–9, very pale and glaucous beneath. ..... 2. J. COSTARICENSIS

1. JACARATIA DOLICHAULA (Donn. Sm.) Woodson, in Ann. Missouri Bot. Gard. 37:404. 1950.

Carica dolichaula Donn. Sm. in Bot. Gaz. 23:247. 1897.

Trees up to 12 m. tall, the trunk usually thickened toward the base, the branches glabrous and unarmed. Leaves palmately compound with 3–5 petiolulate broadly elliptic or obovate, caudate-acuminate leaflets 6–15 cm. long, 2–6 cm. broad, green beneath, the petiolules about 1 cm. long; petioles slender, up to about 15 cm. long. Inflorescences much shorter than the subtending petioles, the staminate up to about 30-flowered, the pistillate usually 1- to 3-flowered. Staminate flowers: calyx lobes broadly ovate, about 1 mm. long; corolla slender and salverform, the tube 3–5 cm. long, about 3 mm. in diameter, scarcely dilating toward the orifice, pale green or greenish white, the lobes oblong-spatulate, obtuse or acute, 1.0–1.25 cm. long, slightly spreading, white occasionally tinged with pink toward the tip; stamens inserted at the orifice of the corolla tube, exserted, the antepetalous

Fig. 3. *Jacaratia dolichaula*

with very short filaments, the alternating whorl sessile, the anthers narrowly oblong, about 5 mm. long, the connective petaloid and somewhat longer than the anther; pistillode narrowly acicular, about 1 cm. long. Pistillate flowers: calyx lobes broadly ovate, about 1–2 mm. long; corolla shortly salverform, the tube about 1.5 cm. long, about 5 mm. in diameter at the base, contracting toward the

middle, then dilated to about 7 mm. at the orifice, white, the lobes narrowly oblong, about 1.5 cm. long, slightly spreading, white; staminodia absent or inserted at the orifice of the corolla tube, sessile, essentially like the stamens of the staminate flower but the anthers somewhat smaller and the petaloid connectives somewhat larger; ovary oblong-ovoid, about 5 mm. long, 5-celled, the stigma with 5 ovate essentially entire lobes. Berries ovoid-fusiform, about 10 cm. long and 5 cm. broad, persistently 5-celled, containing numerous compressed ovoid seeds 7–8 mm. long; fruiting peduncle about 3.5 cm. long.

Costa Rica and Panama, in forests, 200–1000 m. elev. Popular names recorded by Standley in Costa Rica are *papaya, papaya de monte, papayillo, palo de barril,* who explains the last as follows: "The palo de barril, which I believe referable to this species, is common in Guanacaste, where it is a large tree with broad crown and a very thick trunk. This is so soft or spongy that with a few slashes of a machete it is possible to fell a large tree. If a large trunk is thus cut, and left for some weeks to dry, it is possible to separate a cylinder of bark. Sections of this are used in place of barrels, for storing maize and other articles." (Fl. Costa Rica 2:724. 1937).

BOCAS DEL TORO: Fish Creek, vicinity of Chiriquí Lagoon, *Von Wedel 1084, 2207.* VERAGUAS: forested slopes of Cerro Tuté, vicinity of Santa Fé, *Allen 4392.*

2. JACARATIA COSTARICENSIS I. M. Johnston, in Contr. Gray Herb. 70:79. 1924.

Trees up to 20 m. or more, the branches armed with numerous short stout spines, glabrous. Leaves palmately compound with 5–9 very shortly petiolulate oblanceolate shortly acuminate entire leaflets 7–12 cm. long and 2–3 cm. broad, dark green above, very heavily glaucous beneath, the petiolules about 1.0–1.5 cm. long; petioles slender, 10–20 cm. long. Inflorescences shorter than the subtending petioles, the staminate racemose-paniculate, many-flowered, the pistillate erect, long-pedunculate, 1-flowered. Staminate flowers about 17 mm. long, very glaucous without, narrowly clavate in bud, the lobes about 7 mm. long, linear, obtuse, the tube narrowly cylindric, about 1.2 mm. broad, sparsely villous within; stamens strigose, strongly unequal, the filaments conspicuously connate, the anthers similar, without a ligulate connective, with a small erect spiniform process. Berry pyriform, up to about 7 cm. long and 3 cm. broad, orange, the fruiting peduncle pendulous, up to about 10 cm. long.

Costa Rica and Panama, in forests near sea level to about 700 m. elev. Tonduz reports the vernacular name in Costa Rica as *papayillo de venado.*

COLÓN: vicinity of Camp Piña, alt. 25 m., *Allen 3679.*

The description of the flowers is taken from Johnston; our specimen is fruiting. *Jacaratia costaricensis* is closely related to *J. spinosa* (Aubl.) DC., as noted by Johnston. Both species are very glaucous, particularly the lower surface of the leaves, and the chief distinguishing character obvious from our meagre herbarium representation appears in the length of the fruiting peduncles, which are only up to about 2 cm. and suberect in *J. spinosa.*

2. CARICA L.

CARICA L. Spec. Pl. 1036. 1753.

Papaya [Tourn.] Adans. Fam. Pl. 2:357. 1763.
Vasconcellea St. Hil. 2e. Mem. Resed. 13. 1837.

Dioecious or monoecious trees and shrubs, the thick succulent trunk usually unbranched. Leaves simple and palmately lobed in the Panamanian species, long-petiolate. Inflorescences in the axils of the uppermost leaves, thyrsiflorous, the staminate extensive and many-flowered, the pistillate reduced and with fewer larger flowers. Calyx 5-lobed, inconspicuous. Corolla salverform in the staminate flowers, campanulate in the pistillate, the limb 5-lobed, alternisepalous. Stamens 10, the connective occasionally produced at the tip. Ovary usually 1-celled, usually septate at the base, containing numerous ovules on parietal placentas. Berry broadly ovoid-pyriform, 1-celled.

Although the papaya is one of the most common and favorite fruits of the tropics, appearing to the outlander like some celestial melon, the genus is in a state of botanical confusion with at least 50 poorly defined "species" ranging from Mexico to Argentina and in the Antilles. It has been introduced into the Eastern Hemisphere since long ago and frequently escapes.

a. Leaves with 7 palmate primary veins, usually with 7 deeply and irregularly pinnatifid segments; pistil of pistillate flowers with 5 dichotomous or trichotomous stigma lobes; staminate flowers with broadly deltoid calyx lobes about 1 mm. long and yellow or white corollas 3–4 cm. long. 1. C. PAPAYA
aa. Leaves with 5 palmate primary veins, with 5 shallow segments each with 1–2 broad lateral lobes; pistil of pistillate flowers with 5 linear undivided stigma lobes (presumptive for *C. chiriquensis*).
  b. Leaves and inflorescences glabrous or essentially so, the middle segment of the leaves 3-lobed, the 4 lateral segments unlobed; (staminate flowers with white corollas about 4 cm. long and ovate calyx lobes about 1 mm. long?)..... 2. C. CUCURBITIFOLIA
  bb. Leaves and inflorescences rather sparsely villous, the middle segment of the leaves 3-lobed, the 4 lateral segments with a single broadly acute lobe; staminate flowers with pale green corollas 1.5–2.5 cm. long and lanceolate calyx lobes about 3 mm. long..... 3. C. CHIRIQUENSIS

1. CARICA PAPAYA L. Sp. Pl. ed. 1. 1466. 1753.

Papaya sativa Tussac, Fl. Ant. 3:45. *pl. 10–11.* 1824.
Carica Mamaja Vell. Fl. Flum. 10: *pl. 131.* 1827.
Papaya vulgaris A. DC. in DC. Prodr. 15[1]:414. 1864.
Carica hermaphrodita Blanco, Fl. Filip. 3:212. 1879.

Dioecious or occasionally polygamous or monoecious trees 2–8 m. tall with characteristic stout succulent and unbranched trunks, usually glabrous in all parts or essentially so. Leaves in a dense terminal crown, long-petiolate; blade simple but palmately divided into usually 7 more or less irregularly and broadly pinnatifid segments, variable in size but frequently up to 4–5 dm. in diameter; petiole usually up to 5–7 dm. long. Staminate inflorescences repeatedly compound, many-flowered, somewhat shorter than the subtending petioles, spreading or pendulous, the pistillate far shorter than the subtending petioles, usually only 1- to 3-flowered. Staminate

Fig. 4. *Carica papaya*

flowers: calyx lobes very broadly deltoid, obtuse, about 1 mm. long; corolla salverform white or yellow, the tube about 1.5–2.0 cm. long, about 2 mm. in diameter, the lobes oblong, 1.0–1.5 cm. long, slightly spreading; stamens inserted at the orifice of the corolla tube, exserted, the antepetalous anthers about 2.5 mm. long, nearly sessile and descending basally into the corolla tube, the antesepalous anthers erect, wholly exserted, about 2 mm. long, with apically 2-lobed filaments of nearly equal length; pistillode acicular, about 1 cm. long. Pistillate flowers far larger than the staminate, irregularly campanulate, white or pale cream: calyx lobes broadly deltoid, about 1 mm. long; corolla essentially polypetalous or very weakly united, the segments about 5–7 cm. long, 1.5–2.0 cm. broad, broadly acute, irregularly reflexed toward the tips; staminodia lacking, rarely minute and hypogynous; ovary ovoid-ellipsoid, usually about 3 cm. long (including the indefinitely attenuate style) and 2 cm. broad, the stigma essentially sessile, of 5 thick segments about 1 cm. long fimbriately di- or trichotomous toward the tip. Berry extremely variable, up to 3 dm. long and 2 dm. thick, green or yellow when ripe.

Papayos are grown throughout the tropics of the world, chiefly at low elevations, and tend to become escapes everywhere. In Panama they are one of the commonest weed trees, and the quality of their fruits varies from the sublime to the ridiculous. Some of the most inferior produce fruits scarcely larger than a hen's egg. The vast man-made distribution of *Carica papaya* is quite at variance with the very restricted natural ranges of the other published species of the genus, and even the approximate site of the progenitors of the cultivated papaya is now impossible to ascertain: it may well be the eastern slopes of the Peruvian Andes where most of the wild species with similar leaf forms occur today. Under such circumstances the citation of herbarium specimens is apt to become somewhat absurd, but is appended to this account for good measure.

Associated with the latex of all parts of the plant are various proteolytic enzymes, particularly papain, which are isolated and used for various pharmaceutical and gastronomic purposes. In Panama leaves of *papayo* sometimes are cooked with tough meat, or the raw meat softened by wrapping in green leaves and left overnight. Hernando Cortés is said to have observed this use of *papayo* during his conquest of Mexico in the early eighteenth century, and from this source has developed the recently booming process of meat tenderizing, in which papain is a prominent agent.

Carica papaya normally is dioecious. In some districts of Panama the inhabitants adhere to a "superstition" that barren (i.e. staminate) trees of *papayo* can be made fruitful by deeply inscribing in the bark the Sign of the Cross with a machete. I have been shown examples of such incised trees, which do indeed appear to become polygamous. Local experience also has it that such a tree does not become fruitful permanently but must be wounded periodically. The response would appear to have scientific foundation upon the basis of traumatic reversion.

BOCAS DEL TORO: Careening Cay, *Von Wedel 573*. CANAL ZONE: Barro Colorado Island, *Shattuck 165*; low ground, outskirts of Ancón, *Greenman & Greenman 5073*; Cocoli Island, vicinity of Miraflores Lake, *P. White 290*.

Fig. 5. *Carica cucurbitifolia*

2. Carica **cucurbitifolia** Woodson, spec. nov.

Arbores ca. 3–6 m. altae. Folia longe petiolata glabra lamina simplici palmatim 5-divisa basi 5-venosa segmento centrali maximo profunde lateque 3-partito usque 15 cm. longo et lato vel ultra (speciminis nostri juvenalis) segmentis 2 mediis ca. 12 cm. longis 6 cm. latis atque 2 basalibus 6 cm. longis 3 cm. latis omnino integris.

Inflorescentia mascula jam ignota feminea valde contracta usque ca. 7-flora pedunculo ca. 2 cm. longo. Florum femineorum calycis laciniae minute trigonales ca. 2 mm. longae. Corolla ejusdem generis tubulosa ca. 2.5 cm. longa tubo ca. 3 mm. diam. basi videtur lacteo lobis anguste oblongis ca. aequilongis erectis apicem versus roseo-tinctis. Staminodia nulla. Ovarium in flore ovoideum ca. 6 mm. longum glabrum in stylo angusto ca. 3 mm. longo abrupte contractum stigmatibus 5 linearibus integris 10–12 mm. longis. Bacca ignota.

COCLÉ: in heavy forest below grass, region north of El Valle, grass ridge known as the Loma del Tigre, alt. 2800 ft., April 8, 1947, *P. H. Allen 4478* (Herb. Missouri Bot. Gard., HOLOTYPE).

The ovary of *C. cucurbitifolia*, with its slender style, recalls that of *C. stylosa* Heilborn of Peru, the leaf segmentation of which, however, corresponds more closely with that of *C. papaya*. It is unfortunate that staminate flowers are not known. In the herbarium of the Missouri Botanical Garden is a staminate specimen of *papayo* collected by Skutch (no. *4797*) in Costa Rica which appears to be related to *C. cucurbitifolia*, although with a differently divided leaf more similar in outline to that of the succeeding species. The Skutch plant has white corollas about 4 cm. long and ovate calyx lobes about 1 mm. long. It definitely is not *C. papaya* as presently determined.

3. CARICA **chiriquensis** Woodson, spec. nov.

Arbores usque 7 m. altae vel ultra. Folia longe petiolata lamina simplici palmatim 5-divisa basi 5-venosa segmento centrali maximo profunde lateque 3-partito usque 35 cm. longo nisi ultra segmentis mediis ca. 25 cm. longis 12 cm. latis margine inferiore late auriculato segmentis 2 basalibus ca. 20 cm. longis 10 cm. latis margine inferiore acute auriculato membranacea pagina inferiore sparsiuscule villosula. Inflorescentia feminea jam ignota mascula effuse thyrsiflora pedunculis gracilibus dense villosulis. Florum masculorum calycis laciniae lanceolatae apice acuminatae laxe reflexae ca. 3 mm. longae margine minute ciliato. Corolla florum ejusdem generis pallide viridis magnitudine valde variabilis tubo anguste cylindrico extus sparse pilosulo ca. 1.5 mm. diam. tum 5 mm. tum 15 mm. longo lobis linearibus ca. 1 mm. latis extus apice versus densius pilosulis tum 7 mm. tum 12 mm. longis laxe patulis. Stamina 10 ad ostium corollae tubi posita exserta antepetalorum antheris cum appendice apicali ca. 1.5 mm. longis filamento ligulari integro ca. 0.5 mm. longo alternorum vix 1 mm. longis filamento simili sed 2 mm. longo. Pistillodium anguste aciculiforme ca. 8 mm. longum. Bacca ut dicitur ca. 15 cm. longa 13 cm. lata 5-angulata.

CHIRIQUÍ: Quebrada Velo, vic. Finca Lérida, alt. 5000 ft., July 24, 1947, *P. H. Allen 4675* (Herb. Missouri Bot. Gard., HOLOTYPE).

Perhaps it is tempting fate to describe two new dioecious species, apparently closely related, from such neighboring areas as Chiriquí and Coclé when only the complimentary sexual forms are known. The forms differ as indicated in the key and the descriptions, however, and *C. cucurbitifolia* is glabrous while *C. chiriquensis*

is villous. The leaf form of *chiriquensis* is quite similar to that of the Skutch plant from Costa Rica which was discussed under *cucurbitifolia*, but the staminate flowers are strikingly dissimilar.

Fig. 6. *Carica chiriquensis*

LOASACEAE

Mostly perennial or annual herbs, sometimes quite massive, erect or clambering, infrequently twining or climbing, characteristically strongly hispid and with stinging hairs and glochids. Leaves opposite or alternate, variously incised and occasionally palmatifid or pinnatifid; stipules lacking or vestigal. Inflorescence terminal or extra-axillary, basically cymose but frequently monopodial and occasionally reduced to a solitary flower. Flowers dichlamydeous, hermaphrodite, epigynous, 5- or rarely 4-, 6-, or 7-merous; sepals foliaceous, imbricate or open in aestivation; petals free or united at the base, imbricated or contorted; stamens rarely 5–10 or fewer, usually very numerous, the filaments more or less united to the base of the corolla, all fertile or partly staminodial and more or less petaloid; ovary inferior, usually 3- to 5-carpellate and 1-celled with numerous ovules on parietal placentas, rarely 1-carpellate with a single pendulous ovule (*Gronovia*), the style simple with a capitate or obscurely divided stigma. Fruit a variously dehiscent capsule.

Except for the peculiar monotypic genus *Kissenia* of Africa and southern Arabia, the Loasaceae are an American family most frequent in arid or semi-arid regions with greatest diversification in Mexico and the southwestern United States and in Chile. Those who have encountered them in the field remember them henceforth chiefly because of their painfully stinging hairs which seem to have been specially contrived to protect the elaborate and frequently very showy flowers.

a. Ovary 3- to 5-carpellate, with numerous ovules or parietal placentas; stamens 10 to many, frequently staminoidial in part; erect or sprawling herbs; leaves variously incised or lobed, sometimes pinnatifid or pinnate.
  b. Stamens all fertile or the outer becoming centrifugally petaloid..... 1. MENTZELIA
 bb. Fertile stamens antesepalous, staminodia antesepalous.
  c. Flowers 4-merous; staminodia free or united only at the base..... 2. KLAPROTHIA
  cc. Flowers 5-(rarely 6- to 7-)merous; staminodia strongly united into a more or less saccate petaloid scale..... 3. LOASA
aa. Ovary 1-carpellate, with a single apical pendulous ovule; stamens 5, all fertile; slender twiners; leaves very deeply and palmately divided..... 4. GRONOVIA

The genus *Sclerothrix* extends from southern Mexico to Bolivia and is to be expected in Panama. It resembles *Klaprothia* strongly, but may be recognized readily by its spirally contorted fruits.

1. MENTZELIA L.

MENTZELIA L. Syst. ed. 10. 1076. 1759; Urb. in Nova Acta Abh. K. Leop.-Carol. Deutsch. Akad. Naturf. 76:22. 1900.

Bartonia Pursh, in Sims, Bot. Mag. sub *t. 1487*. 1812, non Muhl.
Acrolasia Presl, Rel. Haenk. 2:39. 1835.
Torreya Eaton, Man. Bot. ed. 7. 560. 1836, nec Arn. nec alior.
Creolobus Lilj. Fl. Oefver Sver. Odl. Vext. 67. 1839.
Trachyphytum Nutt. ex Torr. & Gray, Fl. N. Am. 1:533. 1840.
Chrysostoma Lilj. in Linnaea 15:263. 1841.
Hesperaster Cockerell, in Torreya 1:142. 1901.

Fig. 7. ***Mentzelia aspera***

Herbaceous annuals or perennials, rarely small shrubs or trees, the stems and foliage scabrous and hispid, but without stinging hairs. Leaves alternate or opposite, variously incised or lobed. Inflorescence terminal, cymose, usually few-flowered. Flowers large to mediocre; sepals foliaceous, 5; petals 5–10, free or barely united at the base; stamens 10 to very numerous, free or united at the base of the filaments, wholly fertile or the outermost becoming petaloid and sterile; ovary inferior, 1-celled, with few to numerous ovules borne upon 3–7 parietal placentas, the style elongate, filiform, the stigma scarcely dilated, capitate or obscurely divided. Fruit an apically dehiscent 3- to 7-valved capsule.

A genus of nearly 100 species, principally in the western United States and Mexico, but extending along the Pacific coast of South America to Patagonia. A single species is known from Panama.

1. MENTZELIA ASPERA L. Spec. Pl. ed. 1. 516. 1753.

Mentzelia stipitata Presl, Rel. Haenk. 2:40. 1831.
Mentzelia pedicellata Presl, Epim. Bot. 246. 1849.
Acrolasia squalida Hook. f. in Trans. Linn. Soc. 20:222. 1851.

Slender erect or sprawling annuals. Stems slender, dichotomous, up to about 6 dm. long, rather thinly covered with short weak glochidiate hairs. Leaves alternate, rather sparse, shortly but evidently petiolate, the blade rather hastately 3-lobed and irregularly serrate, acuminate, broadly obtuse at the base, about 8 cm. long and 4 cm. broad or somewhat larger toward the base of the stem, diminishing gradually toward the tip, lax and thinly membranaceous, weakly and variously strigillose with simple hairs above and below, the petiole about 5 mm. long. Flowers in few-flowered leafy-bracted cymes at the tips of the branches, mediocre, pale orange or salmon, sessile or essentially so; hypanthium narrowly cylindrical, about 1 cm. long and 1 mm. broad at anthesis, densely covered with slender glochidiate hairs, the calyx lobes broad trigonal at the base, very narrowly subcaudate-acuminate, nearly as long as the hypanthium, sparsely strigillose but without glochidiate hairs; petals 5, obovate, up to 1 cm. long and 5 mm. broad, spreading, pale orange or salmon, slightly united at the base; stamens about 20–30, all fertile, but the outermost somewhat longer and with enlarged somewhat petaloid filaments, somewhat shorter than the petals. Capsule narrowly cylindrical but slightly attenuate toward the base, up to about 2.5 cm. long and 5 mm. broad, 3-valved, covered with the persistent glochidiate hairs.

One of the most widespread species of the genus, occurring from Arizona to Argentina. Rather frequent in dry thickets upon the Pacific slope of Panama.

CANAL ZONE: Balboa Heights, *Greenman & Greenman 5055*; Ancón Hill, *Greenman & Greenman 5114*, *Standley 26360*; between Corozal and Ancón, *Pittier 2209*; Gamboa, *Pittier 4793*; Sosa Hill, Balboa, *Standley 25256, 32150*; Darién station, *Standley 31521*.

2. KLAPROTHIA HBK.

KLAPROTHIA HBK. Nov. Gen. & Sp. 6:96. 1823.

Herbaceous annuals, the stems and foliage rather inconspicuously hispidulous to

essentially glabrous, without stinging hairs. Leaves opposite, distinctly petiolate, serrate. Inflorescence terminal, diffusely cymose, bearing rather numerous small 4-merous flowers. Hypanthium subglobular, the calyx lobes 4, broadly trigonal; petals 4, free; stamens in antepetalous groups of 4–5, with slender minutely papillate filaments; staminodia in antesepalous groups of 4–5, with slender pilosulose filaments barely united at the base and incised flabelliform sterile anthers; ovary 4-carpellary, 1-celled, with 1–2 ovules upon the 4 parietal placentas; style filiform, the stigma very obscurely divided. Fruit a small septicidally 4-valved capsule.

A monotypic genus of relatively high elevations extending from Costa Rica to Venezuela and Bolivia.

Fig. 8. *Klaprothia mentzelioides*

1. KLAPROTHIA MENTZELIOIDES HBK. Nov. Gen. & Sp. 6:96. 1823.

Weak erect or sprawling herbaceous annuals. Stems slender, branching infrequently, up to about 6 dm. long, usually less, inconspicuously pilosulose to essentially glabrous. Leaves opposite, rather sparse, lax and long-petiolate, the blade elliptic to ovate or lanceolate, acuminate, obtuse or somewhat attenuate at the base, rather evenly serrate, up to about 10 cm. long and 5 cm. broad, delicately membranaceous, minutely strigillose upon both surfaces, the petiole slender, up to about 3 cm. long, commonly horizontally spreading or somewhat reflexed. Inflorescence terminal, laxly cymose, bearing rather numerous small white shortly pedicellate flowers. Hypanthium subglobose, about 2 mm. broad, minutely and densely hirsutulose, the calyx lobes broadly trigonal, about 1 mm. long; petals broadly oval or obovate, somewhat cucullate, 6–8 mm. long. Stamens and staminodia of the

genus, about as long as the petals. Capsules oblongoid, about 4–6 mm. long and 2–4 mm. broad, persistently hirsutulose.

Rather frequent in the moist highland forests at elevations of 1500–2000 m.

BOCAS DEL TORO: Robalo Trail, northern slopes of Cerro Horqueta, *Allen 4917, 5002.* CHIRIQUÍ: Bajo Chorro, *Woodson & Schery 650, Davidson 82.*

3. LOASA Adans.

LOASA Adans. Fam. 2:501. 1763.
Ortiga Neck. Elem. 2:400. 1790.
Huidobria C. Gay, Fl. Chil. 2:438. 1846.

Annual or perennial herbs or subshrubs, erect or sprawling, rarely twining, beset in nearly all parts with scabrous, stinging hairs. Leaves alternate or opposite, variously incised and lobed. Inflorescence cymose, terminal or lateral, occasionally reduced to a solitary flower. Flowers mediocre to large, usually 5-merous, rarely 6- to 7-merous; sepals foliaceous, open in aestivation; petals valvate or imbricate, somewhat clawed; stamens numerous, in antepetalous clusters, the filaments elongate, united at the base; staminodia united into conspicuous more or less saccate antesepalous petaloid scales; ovary inferior, 1-celled, with usually numerous ovules borne upon 3–5 parietal placentas, the style usually shortly columnar, the stigma obscurely divided. Fruit a 3- to 5-valved capsule.

75–100 species, extending from Mexico to Patagonia, but particularly numerous in Peru and Chile. The Loasas sting probably more painfully than any nettle, and the quality sometimes is not completely lost from herbarium specimens.

a. Leaves pinnate or very deeply pinnatifid above; flowers mediocre, about 2.5 cm. in diameter, the petals white..... 1. L. RUDIS
aa. Leaves only moderately lobed and incised.
  b. Leaves somewhat longer than broad, somewhat pinnately lobed; flowers about 5 cm. in diameter, the petals pale green..... 2. L. GRANDIS
  bb. Leaves about as long as broad, somewhat palmately lobed; flowers about 15 cm. in diameter, the petals bright orange..... 3. L. SPECIOSA

1. LOASA RUDIS Benth. Pl. Hartw. 75. 1839.

Loasa rhoeadifolia Schlecht. in Linnaea 14:382. 1840.
Loasa bipinnata Donn. Sm. in Bot. Gaz. 23:7. 1897.
Loasa triphylla Juss. var. δ *rudis* (Benth.) Urb. & Gilg, in Nova Acta, Abh. K. Leop.-Carol. Deutsch Akad. Naturfor. 76:239. 1900.

Weak annual herbs up to about 1 m. tall. Leaves alternate, rather sparse, pinnate or very deeply pinnatifid above, the uppermost greatly reduced and simple, the lower shortly petiolate, up to about 15 cm. long and 9 cm. broad, with 3–5 pairs of oblong-elliptic coarsely serrate leaflets or lobes. Flowers several in laxly monochasial, leafy-bracted terminal cymes; pedicels 5–10 mm. long; calyx lobes 5, broadly ovate-trigonal, obtuse, 6 mm. long and broad; petals 5, broadly spatulate, 1 cm. long, widely spreading, white; staminodia profoundly saccate, about 5 mm. long, striped with red or pink. Capsules erect upon the accrescent pedicels, rather narrowly campanuate, up to 2 cm. long and 1 cm. broad, densely hispid, the persistent calyx lobes accrescent and about half as long as the capsule.

Fig. 9. *Loasa rudis*

Southern Mexico to Panama, where the plant is known locally as *pringamoza* or *pringamosca*. A frequent herb in pastures and forest clearings at elevations of 1500–2000 m.

CHIRIQUÍ: upper Río Chiriquí Viejo valley, near Cerro Punta, *G. White 39*; Bajo Chorro, Boquete District, *Davidson 277*, *Woodson & Schery 645*; Casita Alta, Volcán de Chiriquí, *Woodson, Allen & Seibert 936*.

This plant probably is not conspecific with true *L. triphylla* of Ecuador and Peru which, as the name suggests, has palmately divided leaves. However, our plant may eventually prove to be conspecific with *L. papaverifolia* HBK. which extends from Colombia and Venezuela to Chile; in this case, *L. rudis* will have to be superceded by the earlier name.

2. LOASA GRANDIS Standl. in Journ. Wash. Acad. Sci. 17:12. 1927.

Very large coarse herbs up to about 4 m. tall. Leaves alternate, rather sparse, long-petiolate, broadly oval and divided into 6–8 broad coarsely serrate lobes, up to 4 dm. long and 3 dm. broad, gradually reduced above, the petiole 3–8 cm. long. Flowers several or rather few in leafy-bracted, lax terminal cymes; pedicels about 2 cm. long; calyx lobes 5, broadly ovate, about 1 cm. long, sparsely serrate-dentate; petals 5, pale green, cucullate, broadly obovate, about 2.5 cm. long, 1.5 cm. broad; scales broadly oval-cucullate, 5–6 mm. long, entire or broadly 3-lobed at the tip (exappendiculate?) 3-nerved, the opposite staminodia narrowly acicular, long-acuminate, minutely puberulent immediately above the slightly enlarged base, about 1 cm. long; stamens in groups of about 12 opposite the petals, the filaments about 1.5 cm. long, the anthers about 2 mm. long; roof of the ovary about 1 cm. in diameter, densely arachnoid-villous; style about 5 mm. long. Capsules broadly turbinate, about 2 cm. long, dehiscing with 5 broad valves alternate with the calyx lobes; seeds innumerable, about 1 mm. long or somewhat less.

Panama and Costa Rica (?), in clearings of moist forest, 70–1000 m. elev.

CANAL ZONE: forest along banks of Quebrada La Palma and Cañon of Río Chagres, *Dodge & Allen 17336*. COCLÉ: north rim of El Valle de Antón, *Allen 1658*.

The type of *L. grandis* comes from Guanacaste, Costa Rica. I have not been able to detect the three small conic appendages below the apex of the scales described by Standley for the Costa Rica plants.

3. LOASA SPECIOSA Donn. Sm. in Bot. Gaz. 23:8. 1897.

Large coarse weak herbs up to 2 m. tall, abundantly covered with long brown stinging hairs. Leaves opposite or subopposite, long-petiolate, the blade about as long as broad, somewhat palmately lobed and serrate in the manner of a maple leaf, up to 15 cm. long and broad or somewhat larger below, the petiole up to 12 cm. long. Flowers solitary or in few-flowered terminal cymes, the pedicels up to 6 cm. long; calyx lobes 5, ovate-lanceolate, acuminate, about 3 cm. long; petals 5, bright orange, broadly oval, 5–6 cm. long, flat or essentially so, slightly spreading; scales about 1.8 cm. long, broadly truncate-triangular, the tip unequally 4-lobed, the

Fig. 10. *Gronovia scandens*

lateral lobes somewhat longer, with 2 broadly oval sacs at the base, the staminodia 2, about 2.5 cm. long, narrowly acicular but greatly bulbose at the base, minutely and closely aculeolate; stamens in groups of about 14 opposite the petals, the filaments glabrous, about 2 cm. long, the anthers about 2 mm. long; style slender, 1.5 cm. long, minutely hispidulose toward the base, the stigma subcapitate. Capsules narrowly campanulate, about 2 cm. long and 1 cm. broad, bearing innumerable reticulate seeds about 1 mm. broad upon usually 3 parietal placentas.

Highland Costa Rica and western Panama, in forest clearings at about 2000–2500 m. elev.

CHIRIQUÍ: Bajo Chorro, Boquete District, *Davidson 445*; vicinity of Cerro Punta, *Allen 3486*.

With its bright orange flowers 15 cm. or more in diameter, this is one of the most showy herbs of the Chiriquí mountains, but is also one of the most painful *ortigas*.

4. GRONOVIA L.

GRONOVIA L. Sp. Pl. ed. 1. 202. 1753.

Slender annual twiners covered with weak uncinate hairs on all parts. Leaves alternate, long-petiolate, the blade very deeply and palmately divided and coarsely dentate, broadly ovate-reniform, deeply cordate. Inflorescence extra-axillary, several times dichasial with the ultimate branches monochasial, bearing numerous rather small sessile flowers. Calyx lobes 5, subfoliaceous, valvate; petals 5, free, open in aestivation; stamens 5, antesepalous, all fertile; ovary 1-celled, containing a solitary pendulous ovule, the style rather slender, the stigma subcapitate. Fruit a small 5-winged cypsela crowned by the persistent calyx.

Two species, extending from Mexico to Venezuela and Peru.

1. GRONOVIA SCANDENS L. Sp. Pl. ed. 1. 202. 1753.

Slender annual twiners, weakly uncinate-pilose in all parts. Leaves rather sparse, long-petiolate, the blade broadly ovate-reniform, deeply cordate, up to 8 cm. long and 9 cm. broad, deeply and palmately divided into usually five unequal, narrowly acuminate lobes, the middle somewhat longest, entire, the lateral decreasingly smaller and with 1 to several broad dentate incisions, the petiole up to 7–8 cm. long. Inflorescence about equaling the leaves, compound, bearing numerous rather small sessile flowers. Flowers greenish yellow; sepals oblong-lanceolate, acute, 5–6 mm. long; petals rather narrowly spatulate, acuminate, about 3 mm. long; stamens about 4 mm. long, the filaments scarcely longer than the anthers. Fruits pentagonal-obovoid, about 3–4 mm. long, decurrently 5-winged from the tip, crowned by the persistent, somewhat accrescent sepals.

Southern Mexico to Venezuela and Ecuador, in lowland thickets.

PANAMÁ: vicinity of Old Panamá, *Woodson & Schery 948*.

BEGONIACEAE

By LYMAN B. SMITH and BERNICE G. SCHUBERT

1. BEGONIA L.

Begonia L. Sp. Pl. 1056. 1753; A. DC. in DC. Prod. 15[1]:278. 1864.

Eupetalum Lindl. Nat. Syst. ed. 2, 440. 1836.
Trilomisa Raf. Fl. Tellur. 2:91. 1836.
Mezierea Gaud. Bot. Voy. Bonite, *pl. 32*. 1839.
Falkea Koenig ex Steud. Nomencl. Bot. ed. 2, 1:194. 1840.
Diploclinium Lindl. Veg. Kingd. 319. 1847.
Platyclinum T. Moore in Moore & Ayers, Gard. Mag. Bot. 2:153. 1850. Nom. prov.
Sphendanthera Hassk. in Versl. Acad. Wetensch. Amsterdam 4:139. 1855.
Nephromischus Kl. in Ind. Sem. Hort. Berol. App. 1. 1855.
Huszia Kl. in Monatsber. Akad. Berlin 121. 1854.
Saueria Kl. in Monatsber. Akad. Berlin 122. 1854.
Barya Kl. in Monatsber. Akad. Berlin 122. 1854.
Knesebeckia Kl. in Monatsber. Akad. Berlin 122. 1854.
Gaerdtia Kl. in Monatsber. Akad. Berlin 123. 1854.
Trendelenburgia Kl. in Monatsber. Akad. Berlin 123. 1854.
Ewaldia Kl. in Monatsber. Akad. Berlin 123. 1854.
Gurltia Kl. in Monatsber. Akad. Berlin 123. 1854.
Scheidweileria Kl. in Monatsber. Akad. Berlin 123. 1854.
Lepsia Kl. in Monatsber. Akad. Berlin 123. 1854.
Riessia Kl. in Monatsber. Akad. Berlin 123. 1854.
Mitscherlichia Kl. in Monatsber. Akad. Berlin 123. 1854, as "*Mitcherlichia*".
Rachia Kl. in Monatsber. Akad. Berlin 124. 1854.
Petermannia Kl. in Monatsber. Akad. Berlin 124. 1854.
Augustia Kl. in Monatsber. Akad. Berlin 124. 1854.
Gireoudia Kl. in Monatsber. Akad. Berlin 125. 1854.
Rossmannia Kl. in Monatsber. Akad. Berlin 125. 1854.
Magnusia Kl. in Monatsber. Akad. Berlin 125. 1854.
Haagea Kl. in Monatsber. Akad. Berlin 125. 1854.
Tittelbachia Kl. in Monatsber. Akad. Berlin 126. 1854, as "*Titelbachia*".
Pritzelia Kl. in Monatsber. Akad. Berlin 126. 1854.
Wageneria Kl. in Monatsber. Akad. Berlin 126. 1854.
Doratometra Kl. in Monatsber. Akad. Berlin 126. 1854.
Pilderia Kl. in Monatsber. Akad. Berlin 127. 1854.
Donaldia Kl. in Monatsber. Akad. Berlin 127. 1854.
Moschkowitzia Kl. in Monatsber. Akad. Berlin 127. 1854.
Stibadotheca Kl. in Monatsber. Akad. Berlin 127. 1854, as "*Stiradotheca*".
Casparya Kl. in Monatsber. Akad. Berlin 127. 1854.
Isopteryx Kl. in Monatsber. Akad. Berlin 127. 1854, as "*Isopteris*".
Sassea Kl. in Monatsber. Akad. Berlin 128. 1854.
Reichenheimia Kl. in Abh. Akad. Berlin 1854:54. 1855.
Steineria Kl. in Abh. Akad. Berlin 1854:64. 1855.
Trachelanthus Kl. in Abh. Akad. Berlin 1854:82. 1855.
Cyathocnemis Kl. in Abh. Akad. Berlin 1854:100. 1855.
Weilbachia Kl. & Oerst. ex Kl. in Abh. Akad. Berlin 1854:119. 1855.
Lauchea Kl. in Abh. Akad. Berlin 1854:121. 1855.
Platycentrum Kl. in Abh. Akad. Berlin 1854:123. 1855.
Putzeysia Kl. in Abh. Akad. Berlin 1854:134. 1855.
Trachelocarpus Muell. in Walp. Ann. Bot. 4:909. 1857.
Cladomischus Kl. ex A. DC. in DC. Prod. 15[1]:278. 1864.
Irma Bout. ex A. DC. in DC. Prod. 15[1]:406. 1864.

Begoniella Oliver, in Trans. Linn. Soc. 28:513. 1873.
Semibegoniella C. DC. in Bull. Herb. Boiss. II. 8:327. 1908.

Annual or perennial herbs, shrubs or rarely small trees. Stem elongate and succulent or woody or a cylindrical rhizome or sometimes reduced to a tuberous rhizome, sometimes climbing. Leaves usually alternate or rarely subverticillate, entire, serrate, lobed or digitately compound, usually asymmetric, sometimes peltate, stipules 2, free, persistent or deciduous. Peduncles mostly axillary. Inflorescence usually cymose, sometimes 1-flowered or racemose. Cymes regular or strongly one-sided, usually dichotomous, unisexual or bisexual. Flowers monoecious. Tepals free or rarely connate, usually 4 staminate in two pairs and 5 pistillate. Stamens indefinite, inserted on the receptacle, filaments free or united. Styles usually 3, free or connate, usually bifid, ovary inferior, placentae axile, simple or divided. Fruit capsular, usually bearing 3 unequal wings.

a. Plants acaulescent or subacaulescent with the leaves clustered near the apex of the rhizome, or with slender creeping stolons if the internodes are elongate.
  b. Leaves peltate.
    c. Cymes strongly unilateral; capsule-wings slightly unequal; leaves 2–12.5 cm. long..... 1. B. CONCHIFOLIA
    cc. Cymes regular; capsule-wings very unequal; leaves 17–40 cm. long. 2. B. NELUMBIIFOLIA
  bb. Leaves basifixed.
    c. Cymes strongly unilateral.
      d. Stipules ecarinate, coarsely reticulate-nerved; staminate and pistillate tepals 2; largest capsule-wing as high as wide..... 3. B. PLEBEJA
      dd. Stipules alate-carinate with fine inconspicuous nerves; staminate tepals 4; largest capsule-wing wider than high..... 4. B. GARAGARANA
    cc. Cymes regular.
      d. Branches of the cyme 3 or 4 at each node; inflorescence many-flowered..... 5. B. QUATERNATA
      dd. Branches of the cyme 2 at each node.
        e. Plants or at least the petioles densely vestite.
          f. Indument of the petioles consisting of linear trichomes.
            g. Cyme few-flowered; tepals pubescent, the staminate 4, the pistillate 3; slender stolons with elongate internodes often present; capsule reflexed..... 6. B. CARLETONII
            gg. Cyme many-flowered; tepals glabrous, 2 each; capsule erect..... 7. B. VILLIPETIOLA
          ff. Indument of the petioles consisting of lacerate scales; tepals 2.
            g. Cyme not at all umbelliform; capsule erect
              h. Largest capsule-wing narrower than high; leaves entire or slightly serrate, coarsely ciliate..... 8. B. STRIGILLOSA
              hh. Largest capsule-wing wider than high; anthers much shorter than the filaments; leaves ciliate-denticulate..... 9. B. STIGMOSA
            gg. Cyme umbelliform with greatly reduced terminal branches; capsule decurved; anthers longer than the filaments..... 10. B. VESTITA
        ee. Plants completely glabrous.
          f. Pistillate tepals 2 or 3; pistillate bracteoles apparently lacking.
            g. Tepals and upper bracts glandular; staminate tepals nearly equal; stamens on a column; pistillate tepals 2..... 11. B. BREVICYMA
            gg. Tepals and bracts eglandular; staminate tepals very unequal; stamens free, anthers longer than the filaments; pistillate tepals 3..... 12. B. MUCRONISTIPULA
          ff. Pistillate tepals 4; pistillate bracteoles orbicular, entire; staminate tepals very unequal; anthers shorter than the filaments..... 13. B. DAVIDSONIAE
aa. Plants with an erect or ascending stem and distinct internodes.

b. Leaves nearly symmetric, ovate..... 14. B. GLABRA
bb. Leaves distinctly asymmetric.
c. Soft low annuals; tepals not over 3.5 mm. long.
d. Capsule-wings subequal, lunate; stamens free; leaves soon glabrous..... 15. B. SEMIOVATA
dd. Capsule-wings very unequal; stamens on a short column; leaves appressed-pilose above..... 16. B. FILIPES
cc. Coarse herbs or shrubs; tepals larger.
d. Leaves palminerved, transverse or strongly oblique.
e. Bracts persistent, fimbriate; pistillate tepals 5; staminate tepals 4..... 17. B. FISCHERI
ee. Bracts deciduous, entire; pistillate tepals 2 or 3.
f. Cymes few-flowered; peduncles short; capsule-wings equal or subequal; pistillate tepals 3.
g. Plant pubescent at least on the underside of the leaves; capsule scarcely if at all beaked..... 18. B. OAXACANA
gg. Plant glabrous except for a ring of trichomes at the apex of the petiole; capsule slenderly beaked..... 19. B. UDISILVESTRIS
ff. Cymes many-flowered; peduncles elongate; capsule-wings very unequal; pistillate tepals 2.
g. Secondary branches much reduced making the inflorescence appear umbellate, young inflorescence enclosed by two large bracts; leaves pubescent..... 20. B. INVOLUCRATA
gg. Secondary branches normal; inflorescence distinctly and regularly cymose; leaves glabrous..... 21. B. MULTINERVIA
dd. Leaves penninerved, straight or slightly oblique.
e. Ovary and capsule equally 3-horned from the upper part of the angles; cymes few-flowered.
f. Leaves dimidiate at base; anthers linear; pistillate tepals 5; styles multifid..... 22. B. URTICAE
ff. Leaves deeply cordate at base; anthers subglobose; pistillate tepals 3; styles bifid..... 23. B. HEYDEI
ee. Ovary bearing 3 wings which are attached the full length of the angles and are usually distinctly unequal.
f. Capsule-wings subequal; leaves falcate, oblanceolate, acuminate..... 24. B. TONDUZII
ff. Capsule-wings strongly unequal.
g. Leaves subulate-dentate; cymes globose, many-flowered; staminate tepals 4, subequal..... 25. B. OPULIFLORA
gg. Leaves with flat acute not subulate teeth.
h. Pistillate tepals 5; styles multifid; staminate tepals 4; very unequal. ..... 26. B. GUADUENSIS
hh. Pistillate tepals 2 or rarely 3; staminate tepals 2 (or if 3 or 4 then the styles merely bifid).
i. Internode very short; plants scandent; staminate tepals 4. ..... 27. B. ESTRELLENSIS
ii. Internodes elongate; plants usually erect; staminate tepals 2 (rarely 3 or 4).
j. Capsule 10–12 mm. high exclusive of the wings; cymes moderately floriferous..... 28. B. SEEMANNIANA
jj. Capsule 6–10 mm. high exclusive of the wings; cymes densely floriferous.
k. Leaves 5–7.5 (–11) cm. long, 2.5–3.7 (–4.7) cm. wide, serrate-denticulate..... 29. B. CARPINIFOLIA
kk. Leaves 8.5–15 cm. long, 4–7.5 cm. wide, somewhat denticulate..... 30. B. CONVALLARIODORA

1. BEGONIA CONCHIFOLIA A. Dietr. in Allg. Gartenzeit. 19:258. 1851.

Begonia scutellata Liebm. in Kjoeb. Vidensk. Meddell. 1852:9. 1853.
Gireoudia conchifolia Kl. in Monatsber. Akad. Berlin 125. 1854.
Giroudia warscewicziana Hort. ex A. DC. in DC. Prod. 15[1]:338. 1864, nomen in synon.
Begonia pumilio Standl. in Ann. Missouri Bot. Gard. 27:322. 1940, non Irmscher, 1929.

Herbaceous. Rhizome oblique, 5 mm. thick, internodes very short. Leaves

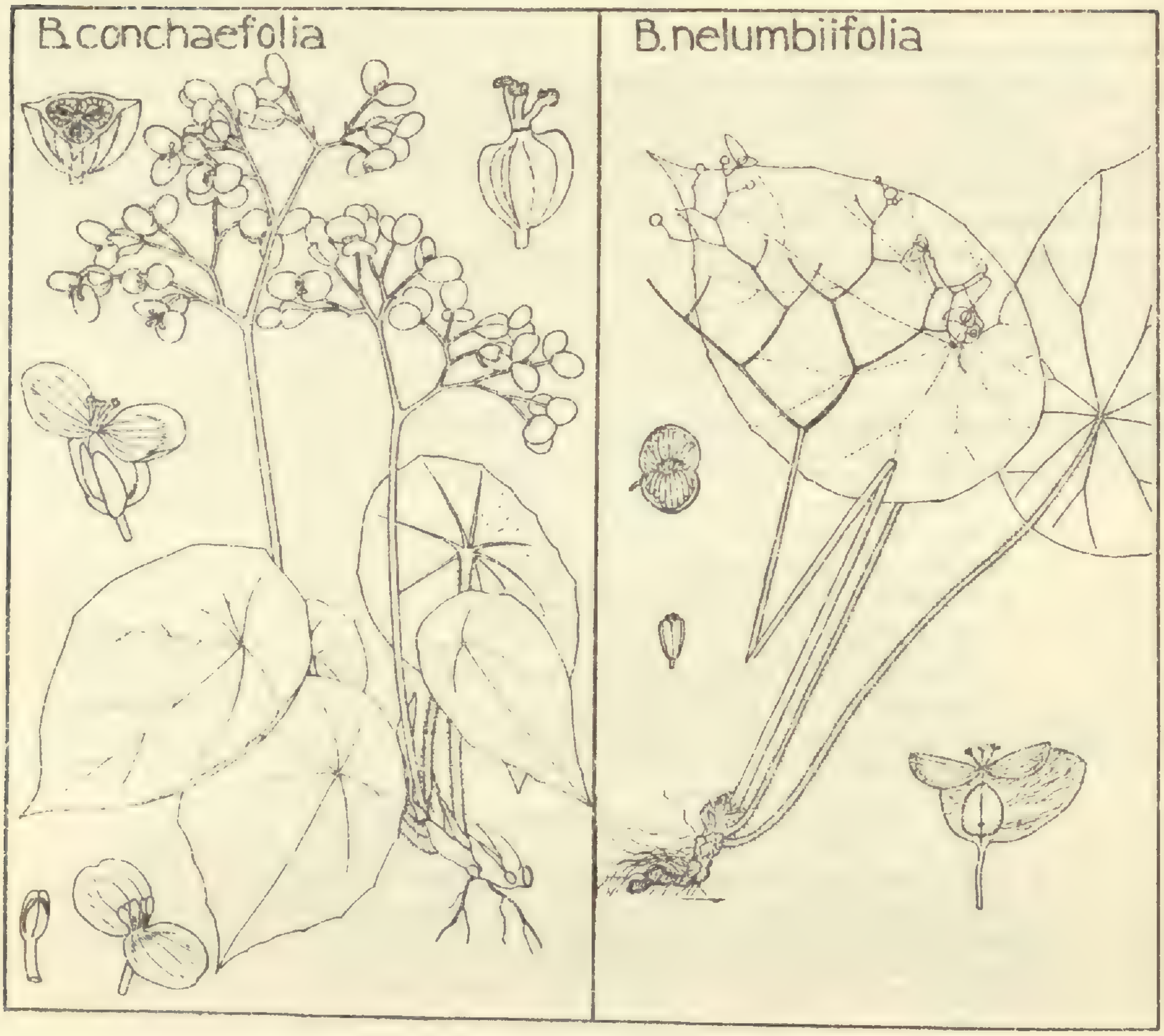

Fig. 11. *Begonia conchifolia* and *B. nelumbiifolia*

peltate, broadly ovate, acuminate, 7–8-nerved, entire or dentate at the ends of the nerves, 2–12.5 cm. long, nearly or quite glabrous above, rufous-pilose beneath especially on the nerves, fleshy, petioles 3–10 cm. long, rufous-pilose, stipules persistent, ovate, setose-acuminate, brown, glabrous or sparsely pilose. Peduncles much exceeding the leaves, to 15 cm. long, rufous-pilose. Cymes bisexual, strongly unilateral and often much longer than wide, few- to many-flowered. Bracts deciduous, small, lanceolate to obovate, entire, setose-ciliate. Pedicels 4–12 mm. long. Staminate tepals 2, suborbicular, 4–5 mm. long, entire, pink. Stamens few, free. Pistillate bracteoles elliptic, nearly equaling the ovary. Pistillate tepals 2, like the staminate. Ovary 3-celled, placentae bilamellate, ovuliferous throughout, styles connate at base, stigmas lunate-capitate. Capsule erect, subglobose, wings slightly unequal, sublunate, angled near apex.

Honduras, Costa Rica, Panama.

COCLÉ: epiphytic, vicinity of La Mesa, hills north of El Valle de Antón, alt. 1000 m., *Allen 2297*; vicinity of El Valle de Antón, *Allen 2925*. PANAMÁ: on boulders, Cerro Campana, *Allen 2089*.

2. BEGONIA NELUMBIIFOLIA Schlecht. & Cham. in Linnaea 5:604. 1830.

Begonia derycxiana Lem. in Hortic. Univ. 5: misc. 355. 1844.
Gireoudia nelumbiifolia Kl. in Monatsber. Akad. Berlin 125. 1854.
Begonia caudilimba C. DC. in Smithson. Misc. Coll. 69: no. 12:9. 1919.

Herbaceous. Rhizome repent, short, 15 mm. thick, setose, internodes extremely short. Leaves peltate, obliquely very broadly ovate or subelliptic, 7–9-nerved, evenly rounded except for the abruptly acuminate apex or slightly produced at the ends of the nerves, 17–40 cm. long, 10–28 cm. wide, remotely denticulate, soon glabrous, the margin ciliate and sometimes purple, thin, petioles 15–45 cm. long, to 8 mm. thick, sparsely rufous-hirsute, becoming glabrous, stipules persistent, lanceolate, over 2 cm. long, entire, rather firm, pilose. Peduncle usually exceeding the leaves, to 66 cm. long, 6 mm. thick, soon glabrous. Cyme regular, much branched, diffuse, 2–5 dm. broad. Bracts deciduous, ovate, obtuse. Pedicels slender, 9–22 mm. long. Staminate tepals 2, suborbicular, 6–8 mm. long, white. Stamens few, anthers narrowly obovate, equaling or longer than the filaments. Pistillate bracteoles lacking. Pistillate tepals 2, like the staminate. Ovary 3-celled, placentae bifid, ovuliferous throughout, styles connate at base, distinctly divided, the stigmatic surface linear, spiral, continuous. Capsule erect or somewhat nutant, broadly ovoid, 6–10 mm. long, wings very unequal, the largest ovate, obtuse, to 15 mm. wide, seeds ellipsoid, blunt.

Southern Mexico to Colombia.

CANAL ZONE: on rocky bank, forest along the Río Indio de Gatún, near sea level, *Maxon 4866*. DARIÉN: Chepigana District, Cana-Cuasi Trail (Camp 1), alt. 240 m., *Terry 1623*.

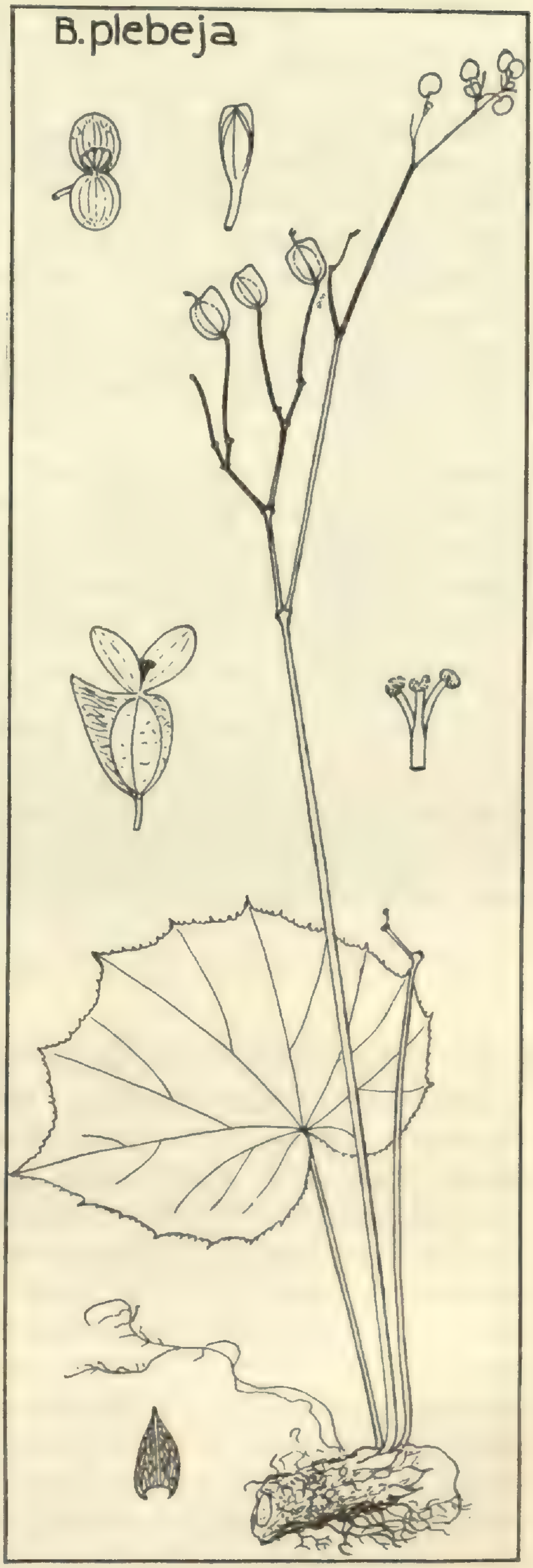

Fig. 12. *Begonia plebeja*

3. BEGONIA PLEBEJA Liebm. in Kjoeb. Vidensk. Meddel. 1852:8. 1853.

Begonia glandulosa sensu J. D. Smith, Enum. Pl. Guat. etc. 4:182. 1895; 5:34. 1899.
Begonia uvana C. DC. in Smithson. Misc. Coll. 69: no. 12:4. 1919.

Herbaceous, fuscous-villous when young. Rhizome usually repent, to 8 cm. long at least, 8–10 mm. thick, internodes very short. Leaves oblique, broadly ovate or elliptic, acute, palmately 7–8-nerved, denticulate, angulate-dentate or almost evenly rounded, cordate, 7–20 cm. long, thin, soon glabrous, petioles erect, 6–28 cm. long, usually soon glabrous, stipules persistent, imbricate, lanceolate, acuminate-setiferous, 1–2 cm. long, entire, heavily and closely reticulate-nerved. Peduncles exceeding the leaves, up to 22 cm. long. Cymes bisexual, strongly unilateral and usually much longer than wide, few- to many-flowered. Bracts deciduous, obovate, ciliate. Staminate tepals 2, broadly ovate, 5–9 mm. long, white or pale pink. Stamens about 15, filaments short, anthers oblong. Pistillate flowers bracteolate. Pistillate tepals 2, like the staminate. Ovary 3-celled, placentae bifid, ovuliferous on all sides, styles short-connate, stigmas lunate-capitate. Capsule suberect, oblong-ellipsoid, 12 mm. long, wings unequal, the largest subtriangular and as high as wide.

Southern Mexico and Central America.

CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 25683, 25759, 25781, 29513*; between Madden Dam and Saddle 11 near Alajuela, alt. 90–100 m., *Dodge, Steyermark & Allen 16503*; Westerly Arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17008*; forest along banks of Quebrada Fea, Q. Pura and Cañon of Río Chagres, alt. 70–100 m., *Dodge & Allen 17408*; forest along telephone trail between the Río Indio Hydrographic Station and the Natural Bridge of Río Puente, *Dodge & Allen 17482*. COCLÉ: vicinity of El Valle, alt. 800–1000 m., *Allen 94*. PANAMÁ: Old Panamá, *Rose 18508*; Taboga Island, *Killip 3167*; *Standley 27966, Allen 1264*; Río Tapia, *Standley 26172, 28288*; Juan Díaz, *Standley 30583*; along road between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen 16683*; Río La Maestra, alt. 0–25 m., *Allen 58*; San José Island, *Johnston 83, 207, 322, 386, 436*. VERAGUAS: Isla de Uva, Contreras group, *Pittier 5109*.

4. BEGONIA GARAGARANA C. DC. in Smithson. Misc. Coll. 69: no. 12:2. 1919.

Herbaceous, completely glabrous. Rhizome repent, only a small terminal section known, internodes very short. Leaves oblique or transverse, palminerved, strongly asymmetric, broadly ovate or elliptic, abruptly acuminate, shallowly cordate at base, to 24 cm. long, entire, petioles erect, 25 cm. long, stipules deciduous, lanceolate, acute, 2 cm. long, entire, alate-carinate, membranaceous with fine inconspicuous nerves. Peduncle much exceeding the leaves, to 75 cm. long. Cymes dichotomous, strongly asymmetric, lax, many-flowered, 15 cm. long. Bracts deciduous, unknown. Pedicels 24 mm. long. Staminate tepals 4, entire, glandular-punctate, the outer broadly obovate, 7–9 mm. long, the inner very narrow. Stamens few on a low torus, filaments very short, anthers narrowly obovoid, 2.5 mm. long, connective scarcely if at all produced. Pistillate flowers unknown. Capsule ovoid or ellipsoid, 8–10 mm. long, wings very unequal, the largest 26 mm. wide, styles deciduous, placentae bifid, ovuliferous throughout, seeds stalked, ellipsoid.

Endemic.

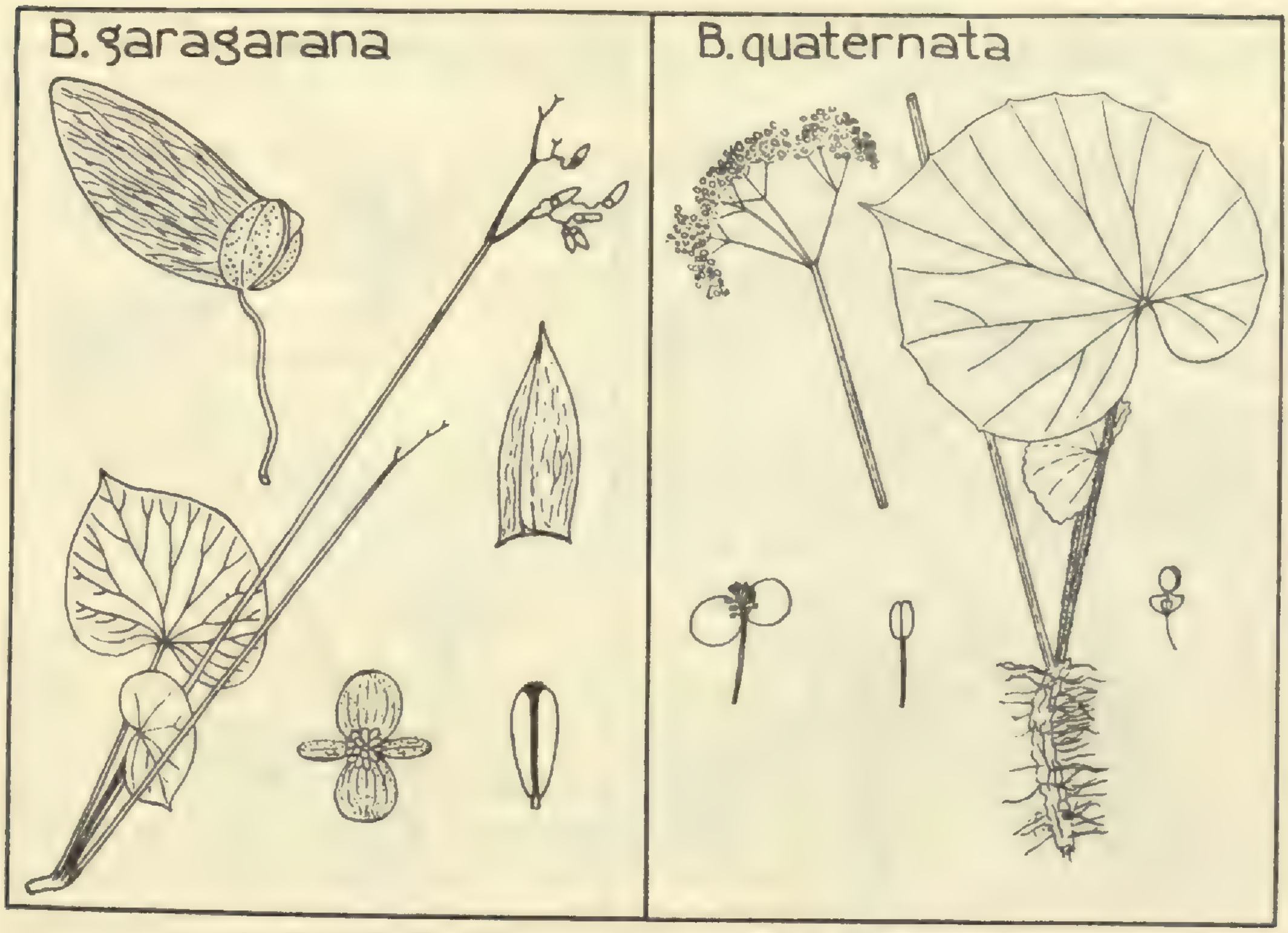

Fig. 13. *Begonia garagarana* and *B. quaternata*

DARIÉN: Cerro de Garagará, Sambú Basin, southern Darién, alt. 500–974 m., *Pittier 5672*. VERAGUAS: forested slopes of Cerro Tuté, vicinity of Santa Fé, alt. 750 m., *Allen 4375*.

5. BEGONIA QUATERNATA Smith & Schubert, in Journ. Wash. Acad. Sci. 40:244. *fig 1, p–s.* 1950.

Stemless with the leaves clustered near the apex of the erect densely rooting rhizome, internodes very short; leaves transverse, very broadly elliptic, obliquely acuminate and also cuspidate opposite the principal nerves, deeply and narrowly cordate at base, 17 cm. long, 14 cm. wide, nearly glabrous above, below densely pilose on the nerves and sparsely elsewhere, petioles slender, 15–18 cm. long, densely vestite with reflexed lacerate fuscous scales, stipules early deciduous, unknown. Peduncles 4 dm. long, much exceeding the leaves, slender, glabrous. Inflorescence regularly cymose, 3–4-radiate, many-flowered, 13 cm. broad, glabrous. Bracts quickly deciduous, small, elliptic, entire. Flowers white (! Allen) but yellow when dry. Staminate tepals 2, suborbicular, 5 mm. long, entire. Stamens inserted on a short column, anthers ellipsoid, slightly shorter than the filaments. Pistillate bracteoles apparently lacking. Pistillate tepals 2, to 2.5 mm. long. Styles bifid, ovary 3-winged, wings equal, broadly ovate.

Endemic.

CHIRIQUÍ: vicinity of "New Switzerland", central valley of Río Chiriquí Viejo, alt. 1800–2000 m., January 6–14, 1939, *Allen 1336*.

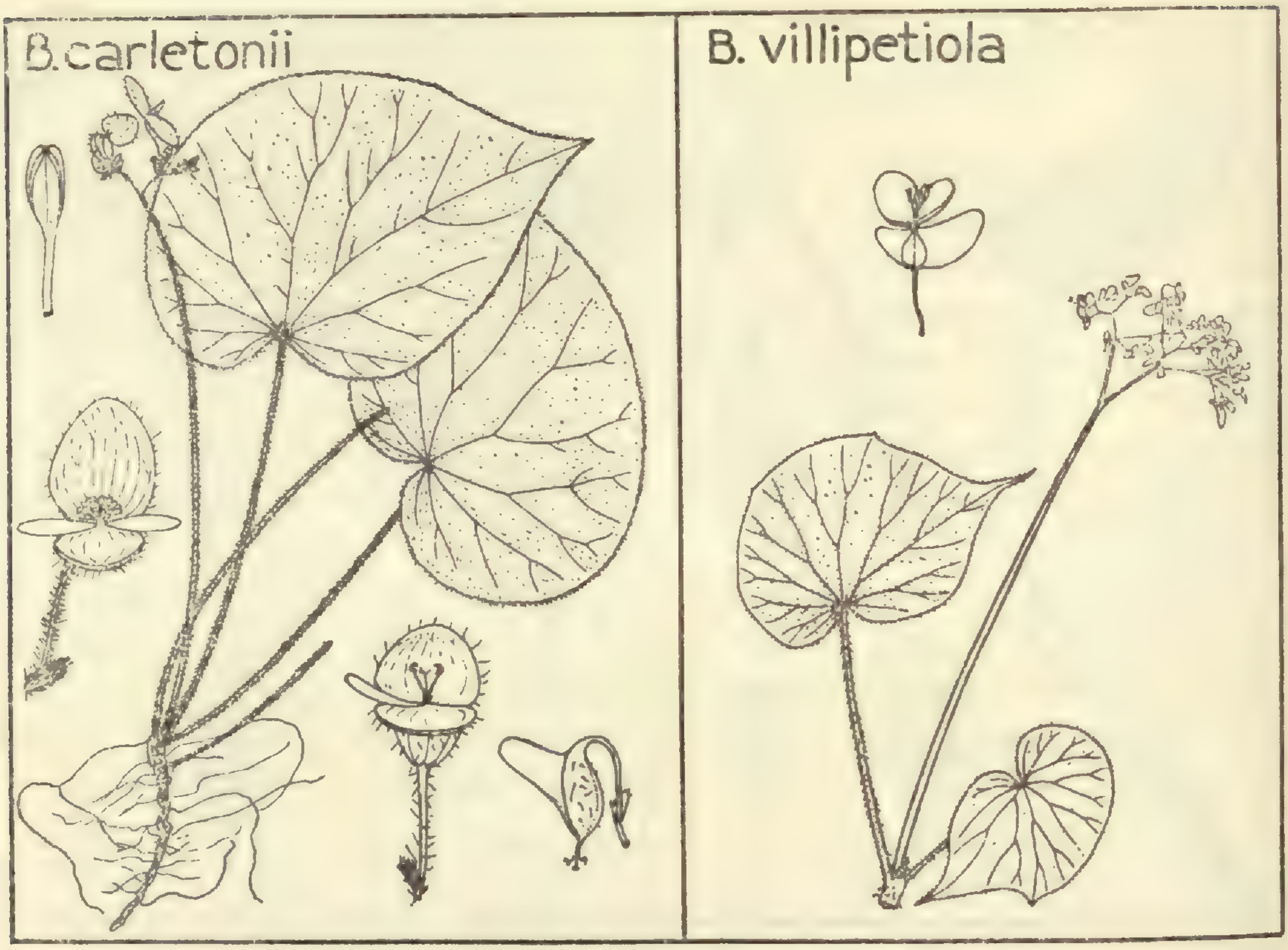

Fig. 14. *Begonia carletonii* and *B. villipetiola*

The general habit of *Begonia quaternata* is reminiscent of that of *B. stigmosa*. However, the flowers of *B. quaternata* are much smaller, and its cyme has four primary rays, a character that is very rare if not unique in North American *Begonia*.

6. Begonia carletonii Standl. in Journ. Wash. Acad. Sci. 17:314. 1927.

Herbaceous. Rhizome slender with short internodes but also producing very slender stolons, with internodes 5–8 cm. long, setose-pilose. Leaves asymmetric, straight or oftener strongly oblique, broadly ovate, abruptly acuminate, cordate at base, 6–16 cm. long, thin, finely sinuate-dentate, ciliate, sparsely setose-pilose on both sides, paler beneath, petioles slender, 5–16 cm. long, reflexed-setose, stipules narrowly lanceolate, 9 mm. long, entire, thin, pilose. Peduncles shorter or longer than the leaves, slender, pilose. Cymes few-flowered, pilose. Bracts subpersistent, ovate or elliptic, obtuse, 3–5 mm. long, entire. Pedicels to 18 mm. long. Staminate tepals 4, entire, white, the outer broadly ovate, obtuse, 6–12 mm. long, sparsely pilose, the inner narrowly oblanceolate, shorter, glabrous. Stamens on a low torus, numerous, anthers obovate, somewhat shorter than the filaments, connective not produced. Pistillate bracteoles apparently wanting. Pistillate tepals 3, otherwise like the staminate. Ovary 3-celled, pilose, styles slightly connate at base, the stigmatic surface lunate. Capsule sharply reflexed, ellipsoid, 7 mm. long, wings very unequal, the largest reflexed from the lower half of the capsule, oblong, obtuse, 5 mm. wide, the others narrowly lunate.

Endemic.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 206*; locality uncertain, *Carleton 206*. CHIRIQUÍ: Fish Creek Mountains, vicinity of Chiriquí Lagoon, *von Wedel 2271*; Fish Creek, *von Wedel 2222*.

7. BEGONIA VILLIPETIOLA C. DC. in Smithson. Misc. Coll. 69: no. 12:5. 1919.

Herbaceous. Rhizome short with extremely short internodes, rooting densely. Leaves strongly asymmetric, transversely ovate, abruptly acuminate and often with a second cusp or lobe more nearly opposite the petiole, cordate at base, 15–21 cm. long, ciliate-denticulate, thin, sparsely pilose above, more densely so beneath especially on the nerves, petioles slender, 15–25 cm. long, densely villous with linear trichomes, stipules deciduous, triangular-ovate, acuminate, 15–20 mm. long, pilose. Peduncle 18–37 cm. long, exceeding the leaves when in fruit, becoming glabrous. Cymes bisexual, regularly dichotomous, many-flowered, subdense, glabrous except for the bracts. Bracts quickly deciduous, the lowest large, broadly elliptic, entire, pilose. Flowers pink or white. Staminate tepals 2, suborbicular, 10 mm. long, entire. Stamens free, numerous, anthers obovate, shorter than the filaments, connective not produced. Bracteoles lacking. Pistillate tepals 2, like the staminate but smaller. Ovary 3-celled, placentae bilamellate, ovuliferous throughout, styles connate at base, stigmatic tissue linear, spiral, continuous. Capsule erect, subglobose, 4–5 mm. long, wings distinctly unequal, broadly ovate, the largest to 11 mm. wide.

Endemic.

CANAL ZONE: Mojinga Swamp near mouth of Río Chagres, alt. 1 m., *Allen 864*. COCLÉ: Bismark above Penonomé, *Williams 309*; vicinity of El Valle, alt. 600–1000 m., *Allen 213, 238, 1184, 1664, 2906, 4216*.

8. BEGONIA STRIGILLOSA A. Dietr. in Allg. Gartenzeit. 19:330. 1851.

Gireoudia strigillosa Kl. in Monatsber. Akad. Berlin 125. 1854.
Begonia daedalia Lem. in Ill. Hortic. 7: misc. 54. 1860. 8: *pl. 269*. 1861.
Begonia barbana C. DC. in Bull. Soc. Bot. Belg. 35: pt. 1:261. 1896.

Herbaceous. Rhizome varying from short and compact with very short internodes and imbricate stipules to slender and branching with distinct internodes. Leaves oblique, broadly ovate, acuminate, 7–17 cm. long, entire or slightly serrate, rounded to angulate-dentate, coarsely ciliate, glabrous above, sparsely long-pilose below especially on the nerves, often spotted or mottled, petioles to 18 cm. long, often spotted, bearing numerous reflexed fimbriate scales, stipules lanceolate with a setiferous apex and often fimbriate keel, persistent. Peduncle usually exceeding the leaves, sparsely pilose, often purple-spotted. Cyme 2–4-branched, subsymmetrical, mostly glabrous, diffuse. Bracts deciduous, elliptic, entire, mucronulate. Staminate tepals 2, suborbicular to obovate, 6–9 mm. long. Stamens few, the anthers oblong, obtuse. Pistillate bracteoles lacking. Pistillate tepals 2, like the staminate. Ovary 3-celled, placentae bifid, ovuliferous throughout, styles persistent, connate at base, somewhat bifid, stigmas linear. Capsule suberect, ovoid or elliptic-ovoid, locules to 10 mm. long, the two larger wings subtriangular or subobtuse to acuminate.

Guatemala, Costa Rica.

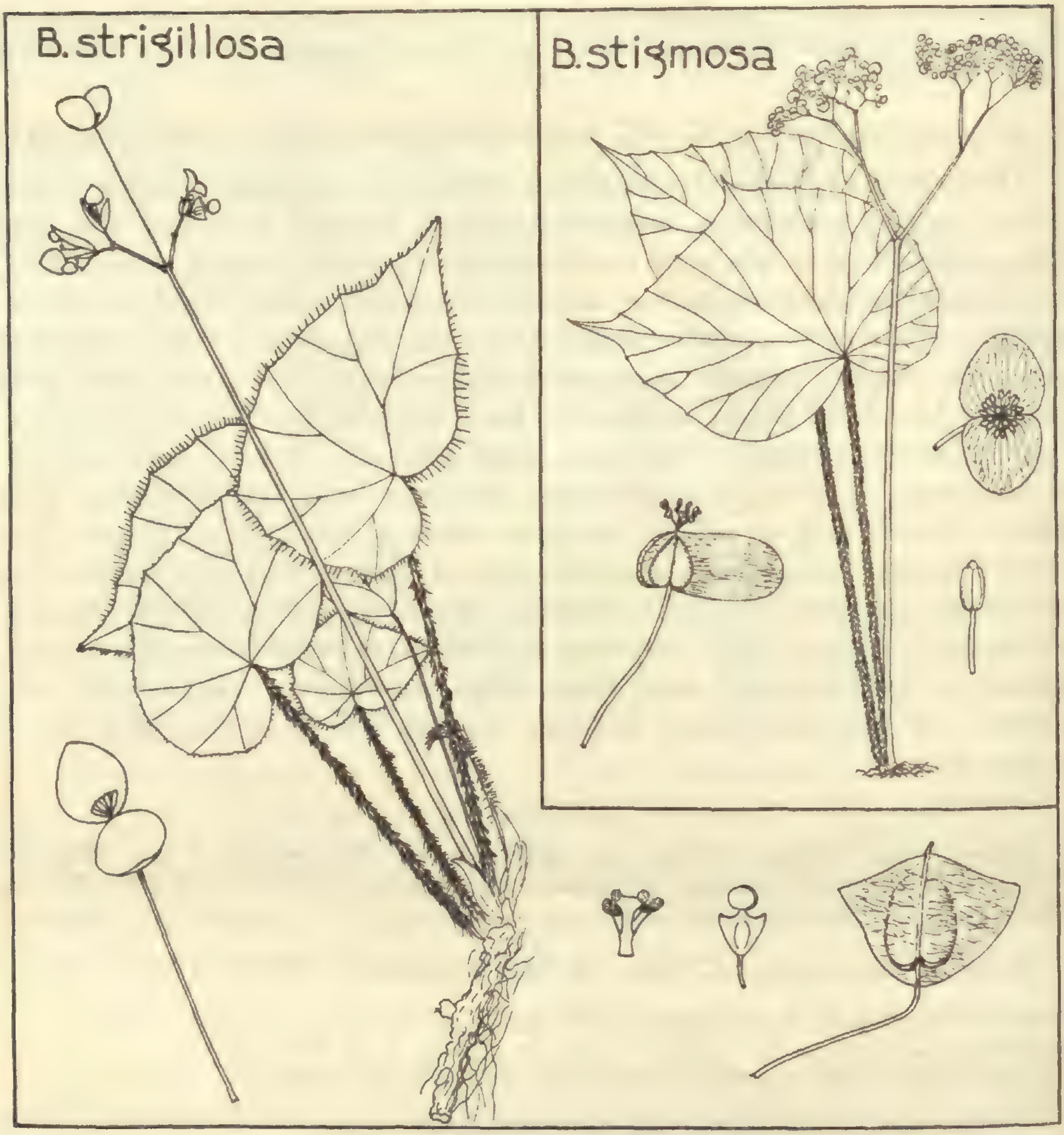

Fig. 15. *Begonia strigillosa* and *B. stigmosa*

Indefinite. Seed no. 7 from Mr. Clayton Kelly of Long Beach, California. Mr. Rudolf Ziesenhenne who sent us the specimen says that it is called water begonia for it grows only near streams in Panama. He considers it a distinct species but so far we are unable to separate it satisfactorily from *B. strigillosa*. *B. strigillosa* has been collected frequently in Costa Rica so that its occurrence in Panama is to be expected.

9. BEGONIA STIGMOSA Lindl. in Bot. Reg. 31: misc. 32. 1845.

Begonia squarrosa sensu Seemann, Bot. Herald 128. 1853, nomen, non Liebm. 1853.
Gireoudia stigmosa Kl. in Monatsber. Akad. Berlin 125. 1854.

Herbaceous. Rhizome repent, to 12 cm. long, 1 cm. in diameter, coarsely lepidote, internodes very short and covered by the stipules. Leaves oblique and

strongly asymmetric, very broadly ovate or suborbicular, abruptly acuminate and usually with a second cusp more nearly opposite the petiole, cordate at base, 15–30 cm. long, scarcely if at all lobed, ciliate-denticulate, thin, glabrous above or with a few small white trichomes, the nerves beneath bearing trichomes like those on the petiole but smaller, petioles erect, to 38 cm. long, 4–10 mm. in diameter, covered with spreading to reflexed narrowly triangular lacerate pink scales 3–5 mm. long, stipules tardily deciduous, lanceolate, pilose, membranaceous, 15–20 mm. long. Peduncle 2–5 dm. long, 7 mm. in diameter, soon glabrous. Cymes bisexual, nearly regular, few- to many-flowered, 7–22 cm. long, lax, glabrous. Bracts quickly deciduous, oblong, acute, fimbriate. Pedicels slender, 7–23 mm. long. Flowers white or pink. Staminate tepals 2, suborbicular, cordate at base, 10–15 mm. long. Stamens free, very numerous, filaments much longer than the broadly oblong anthers, connective apiculate-produced. Bracteoles lacking. Pistillate tepals 2 like the staminate or rarely a smaller one inside the others. Ovary 3-celled, placentae bifid, ovuliferous throughout, styles bifid, the stigmatic tissue linear, spiral, continuous. Capsule erect, broadly ovoid, 6–8 mm. long, wings very unequal, the largest oblong or subdolabriform, 10–15 mm. wide. the others narrowly marginiform.

Southern Mexico, Central America and Colombia.

CANAL ZONE: forest along banks of Quebrada La Palma and Cañon of Río Chagres, 70–80 m., *Dodge & Allen 17368*. CHIRIQUÍ: forests around El Boquete, alt. 1000–1300 m., *Pittier 2896*; *Maxon 4947*; between Hato del Jobo and Cerro Vaca, eastern Chiriquí, alt. 700–1000 m., *Pittier 5411*.

10. BEGONIA VESTITA C. DC. in Bull. Herb. Boiss. II. 8:315. 1908.

Herbaceous. Rhizome repent, short, internodes very short. Leaves transverse, elliptic or ovate, abruptly acuminate, cordate at base, 7–18 cm. long, palminerved, entire, glabrous above, brown-pilose beneath especially on the nerves, petioles 15–25 cm. long, subdensely pilose with fimbriate scarious scales, stipules deciduous, ovate, membranaceous, 10–15 mm. long. Peduncle not much exceeding the leaves until in fruit, to 35 cm. long, bearing scales like those of the petioles. Cymes bisexual, few-flowered, subumbellate with the ultimate branches greatly reduced. Bracts deciduous. Pedicels 5–15 mm. long. Flowers white or pink, sometimes red-punctate. Staminate tepals 2, suborbicular, 5–7 mm. long, rather fleshy, sparsely pilose. Stamens free, few, anthers oblong, longer than the filaments. Pistillate bracteoles lacking. Pistillate tepals 2, like the staminate. Ovary 3-celled, placentae bilamellate, ovuliferous throughout, styles connate at base, bifid, stigmatic tissue spiral. Capsule sharply deflexed, ellipsoid, 10–12 mm. long, pilose, wings very unequal, the largest subreflexed, broadly ovate, obtuse, to 10 mm. wide, the others narrowly lunate or marginiform.

Costa Rica, Panama.

CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 71*; epiphyte, vicinity of Bajo Chorro, alt. 1900 m., *Woodson & Schery 621*. COCLÉ: region north of El Valle de Antón, alt. 1000 m., *Allen 2906*.

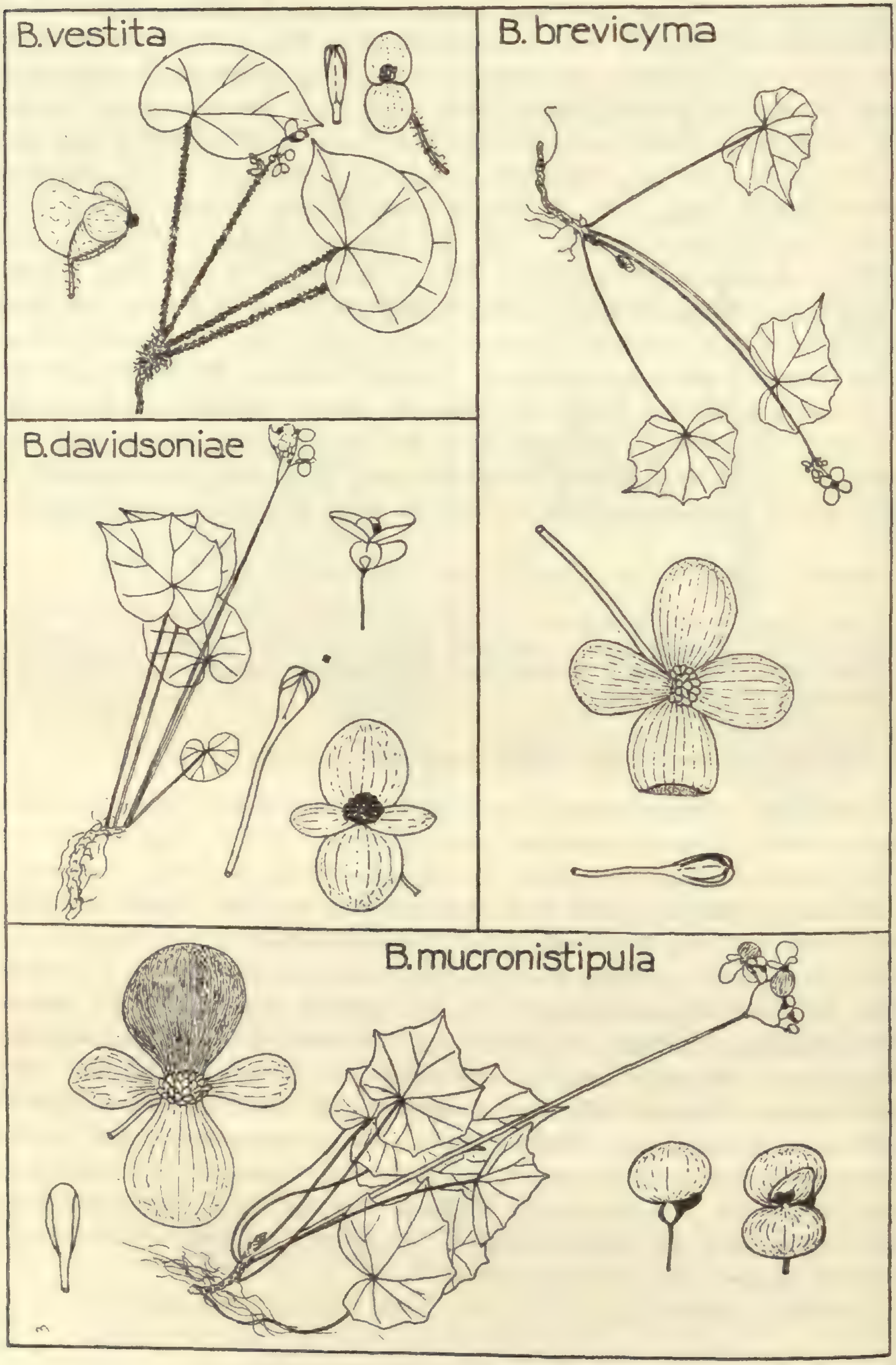

Fig. 16. *Begonia*

11. BEGONIA BREVICYMA C. DC. in Smithson. Misc. Coll. 69: no. 12:3. 1919.

Herbaceous, glabrous. Rhizome 6–7 mm. in diameter, internodes very short. Leaves oblique, palminerved, strongly asymmetric, broadly subelliptic, abruptly acuminate with smaller cusps at the end of the principal nerves, cordate at base, 10–14 cm. long, petioles 16–24 cm. long, stipules persistent, broadly ovate, acuminate, lacerate near apex, 15 mm. long. Peduncles to 26 cm. long. Cyme regular, few-flowered. Bracts tardily deciduous, the lower ample and covering the young flowers, the upper much shorter than the pedicels, glandular. Pedicels to 25 mm. long. Staminate tepals 4, subequal, obovate, 17 mm. long, entire, pinkish white, glandular, the outer somewhat broader. Stamens on a column, numerous, anthers obovate, much shorter than the filaments, connective not produced. Bracteoles wanting. Pistillate tepals 2, broadly ovate, glandular. Wings of the ovary very unequal.

Endemic.

CHIRIQUÍ: epiphyte, vicinity of Bajo Chorro, alt. 1900 m., *Woodson & Schery 620*; humid forest around Los Siguas Camp, southern slope of Cerro de la Horqueta, Chiriquí, alt. 1700 m., *Maxon 5417*.

12. BEGONIA MUCRONISTIPULA C. DC. in Smithson. Misc. Coll. 69: no. 12:3. 1919.

Herbaceous, completely glabrous. Rhizome 6 mm. in diameter, internodes very short. Leaves oblique, palminerved, strongly asymmetric, broadly elliptic, apiculate opposite the principal nerves, otherwise entire, cordate at base, 10 cm. long, petioles erect, 16 cm. long, stipules persistent, broadly ovate, mucronate, nearly 2 cm. long (! C. DC.), entire, thin. Peduncle much exceeding the leaves, 37 cm. long. Cyme regular, few-flowered. Bracts deciduous, unknown. Pedicels to 15 mm. long. Staminate tepals 4, entire, the outer broadly obovate, 20 mm. long, one red and one white, the inner subspatulate, 15 mm. long, white. Stamens free, rather numerous, anthers oblong-obovate, slightly longer than the filaments. Pistillate bracteoles lacking. Pistillate tepals 3, the outer suborbicular, 8 mm. long (possibly immature), the inner one broadly ovate, much smaller. Ovary 3-celled, placentae bilamellate, ovuliferous throughout, styles 3, connate at base, bifid, stigmatic tissue spiral. Capsule-wings very unequal, the largest narrowly triangular, much wider than high, the others narrowly lunate.

Endemic.

CHIRIQUÍ: between the Río Ladrillo and Los Siguas Camp, southern slope of Cerro de la Horqueta, alt. 1200–1700 m., *Pittier 3172*.

13. BEGONIA DAVIDSONIAE Standl. ex Smith & Schubert, in Journ. Wash. Acad. Sci. 40:242. *fig. 1, l–o.* 1950.

Stemless with the leaves clustered near the apex of the short prostrate densely rooting rhizome, glabrous, internodes very short; leaves oblique, broadly ovate, abruptly acuminate and also cuspidate at the ends of the principal nerves, deeply and narrowly cordate at base, 10 cm. long, 7 cm. wide, petioles slender, 17 cm.

long, stipules deciduous, triangular-ovate, acuminate, 12 mm. long, lacerate toward apex, thin. Peduncles slender, to 26 cm. long, exceeding the leaves. Cymes regular, few-flowered, dense. Bracts quickly deciduous. Flowers white or pink (! Davidson). Staminate tepals 4, entire, the outer suborbicular, 12 mm. long, the inner elliptic, 10 mm. long. Stamens numerous, anthers obovate, much shorter than the filaments, connective not produced. Pistillate bracteoles orbicular, entire. Pistillate tepals 4, like the staminate but smaller. Stigmatic tissue spiral, wings of the ovary very unequal, the largest oblong, obtuse, much wider than high, the others narrowly marginiform.

Endemic.

CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., January 5, 1938, *Davidson 38*.

This species appears to be related to *Begonia brevicyma* and *B. mucronistipula* as indicated in the foregoing key, however, it has not been possible to ascertain the detailed structure of the styles and ovary without danger of seriously damaging the type, so there may be greater differences than appear.

14. BEGONIA GLABRA Aubl. Pl. Guian. 2:916. *pl. 349.* 1775.

Begonia scandens Sw. Prodr. 86. 1788.
Begonia elliptica HBK. Nov. Gen. & Sp. 7:180, *pl. 641*. 1825.
Begonia lucida Otto & Dietr. in Allg. Gartenz. 16:162. 1848.
Begonia moritziana Kunth & Bouché in Ind. Sem. Hort. Berol. 16. 1848.
Begonia physalifolia Liebm. in Kjoeb. Vidensk. Meddell. 1852:19. 1853.
Wageneria moritziana Kl. in Monatsber. Akad. Berlin 126. 1854, nomen.
Wageneria lucida Kl. in Monatsber. Akad. Berlin 126. 1854.
Wageneria glabra Kl. in Monatsber. Akad. Berlin 126. 1854.
Wageneria deflexa Kl. in Abh. Akad. Berlin 1854:113. 1855.
Wageneria montana Kl. in Abh. Akad. Berlin 1854:115. 1855.
Begonia locellata A. DC. in Ann. Sci. Nat. IV. 11:137. 1859.

Succulent herb to 9 m. high. Stem scandent, rooting at the nodes, glabrous. Leaves nearly symmetrical, broadly ovate, 4–15 cm. long, short-acuminate, rounded or barely cordate at base, sparsely serrate and ciliate to entire, often undulate, glabrous, petioles 1–8 cm. long, stipules persistent, ovate-oblong, mucronate, entire, 10–24 mm. long, membranaceous, red-brown. Peduncles axillary, 6–20 cm. long. Cymes many-flowered, diffuse. Bracts persistent, minute. Pedicels slender, 6–16 mm. long. Staminate tepals 4, white, the outer broadly obovate, 3–8 mm. long, the inner narrowly elliptic. Stamens free, few, anthers oblong. Pistillate tepals 5, 4–6 mm. long. Styles 3, 2-parted, completely covered by stigmatic papillae, placentae simple. Capsule 6–9 mm. long, largest wing oblong to triangular, 10–14 mm. wide, the other two marginiform, very narrow.

Southern Mexico and the West Indies to Guiana, Bolivia and Peru.

BOCAS DEL TORO: Fish Creek, vicinity of Chiriquí Lagoon, *von Wedel 2204*; Fish Creek Mountains, *von Wedel 2278, 2345*; Farm Six, Changuinola Valley, *Dunlap 500*. CHIRIQUÍ: llanos on slopes of Volcán de Chiriquí Viejo and along Río Chiriquí Viejo, alt. 1200 m., *Allen 982*. COCLÉ: vicinity of El Valle de Antón, alt. 600–1000 m., *Allen 221, 1194, 1655*. PANAMÁ: forests along Río Boquerón above Peluca Hydrographic Station, alt. 90 m., *Hunter & Allen 655*. VERAGUAS: forested slopes of Cerro Tuté, vicinity of Santa Fé, alt. 900 m., *Allen 4357*.

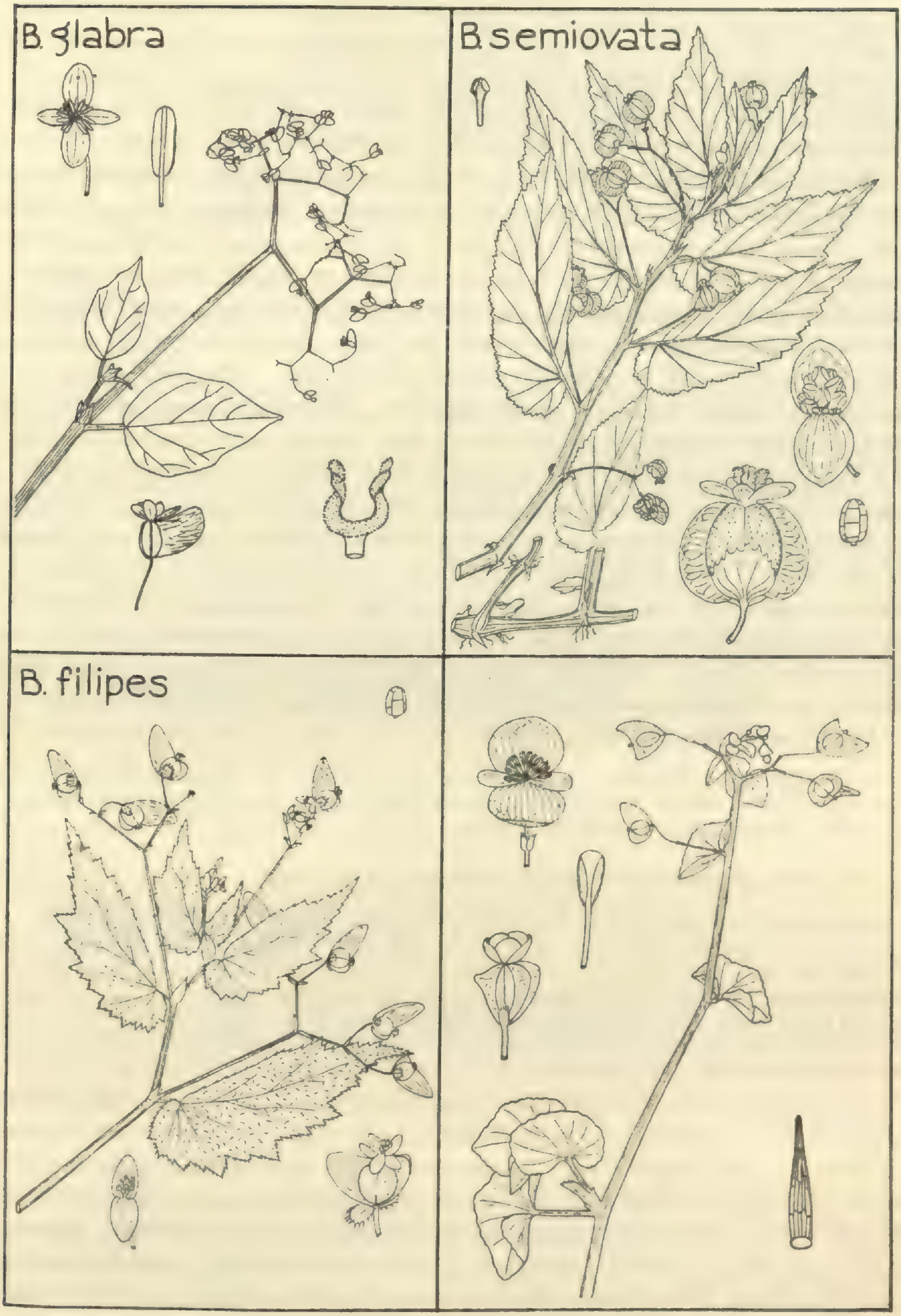

Fig. 17. *Begonia*
(Lower right: *B. fischeri*)

15. BEGONIA SEMIOVATA Liebm. in Kjoeb. Vidensk. Meddel. 1852:22. 1853.

Begonia spruceana A. DC. in Ann. Sci. Nat. IV. 11:142. 1859.
Begonia flexuosa A. DC. in Ann. Sci. Nat. IV. 11:142. 1859.
Begonia guyanensis A. DC. in Ann. Sci. Nat. IV. 11:142. 1859.
Hoffmannella rosea Kl. in A. DC. in DC. Prod. 15[1]:299. 1864. Nomen.
Begonia rosea (Kl.) A. DC. in DC. Prod. 15[1]:299. 1864.
Begonia guyanensis var. *glaberrima* C. DC. in Bot. Gaz. 20:540. 1895.

Herbaceous, slender, 2–6 dm. high. Stem simple or slightly branched, essentially glabrous or glabrescent, prostrate to ascending, sometimes rooting at the nodes. Leaves strongly asymetric, straight (or rarely transversely ovate) acuminate, unequally cuneate to cordate at base, subpinnately nerved, occasionally shallowly lobed with ciliate-serrate margins, 4.5–7 cm. long, 1.5–2 cm. wide, essentially glabrous on both surfaces, petioles 0.5–2 cm. long, glabrous, stipules persistent, lanceolate, up to 2 cm. long, entire, glabrous, acuminate. Peduncles axillary, 2–3 cm. long, glabrous. Cymes laxly few-flowered. Bracts persistent, lanceolate to ovate, subentire to ciliate-serrulate, 1–2 mm. long. Staminate pedicels very slender, to 6 mm. long. Staminate tepals 2, ovate to suborbicular, 2 mm. long and broad. Stamens free, few, anthers elliptic or ovate, the connective produced. Pistillate bracteoles persistent, obovate to orbicular, entire to ciliolate-serrulate to almost lacerate, about 3 mm. long. Pistillate pedicels to 5 mm. long. Pistillate tepals 5, elliptic to ovate, 2–3 mm. long. Styles 3, 2-parted with the stigmatic tissue forming a continuous linear spiral band, ovary 3-celled, placentae variable even in the same ovary. Capsule subelliptic to orbicular, glabrous, 6–14 mm. long, with subequal rounded wings, seeds stalked, oblong and obtuse, truncate at the base.

Mexico and Guiana to Peru.

BOCAS DEL TORO: *Carleton 54*; *von Wedel 370*; vicinity of Nievecita, alt. 0–50 m., *Woodson, Allen & Seibert 1816*; vicinity of Chiriquí Lagoon, *von Wedel 1331*; Changuinola Valley, *Dunlap 167*. CANAL ZONE: Chagres, *Fendler 297*.

16. BEGONIA FILIPES Benth. Bot. Voy. Sulph. 101. 1845.

Begonia hygrophila C. DC. ex Th. Dur. & Pittier in Bull. Soc. Bot. Belg. 35[1]:265. 1896.
Begonia hygrophila var. *puberula* C. DC. ex Th. Dur. & Pittier in Bull. Soc. Bot. Belg. 35[1]: 266. 1896.
Begonia mameiana C. DC. in Smithson. Misc. Coll. 69: no. 12:4. 1919.
Begonia leptopoda C. DC. in Smithson. Misc. Coll. 69: no. 12:6. 1919.
Begonia chepoensis C. DC. in Smithson. Misc. Coll. 69: no. 12:8. 1919.
Begonia heterodonta Rusby, Descr. New Sp. S. Am. Pl. 66. 1926.

Herbaceous, 2–6 dm. high. Stem simple to slightly branched, glabrous, finely ridged. Leaves strongly asymmetric, semiovate to obliquely or transversely ovate, acuminate, mostly truncate at base, palmately nerved with the chief veins branching divaricately above and with the margins crenate-dentate and ciliate, 4–10 cm. long, 2–4 cm. wide, rather abundantly appressed-pilose above with long tapering hairs, essentially glabrous on lower surface, petiole 0.5–4 cm. long, glabrous, stipules mostly persistent, oblong-ovate, acute to acuminate to the setulose tip, 6–12 mm. long, 2–4 mm. wide, very thin, entire. Peduncles axillary, up to 5 cm. long, glabrous. Cymes few-flowered. Bracts persistent, ovate-acute with setulose tip,

up to 7 mm. long and 2 mm. wide. Pedicels glabrous, 4–10 mm. long. Staminate tepals 2, ovate, to 3.5 mm. long and 2 mm. wide. Stamens few, attached to a short column, connective slightly produced. Bracteoles obovate, serrate-ciliate, to 3.5 mm. long, more or less persistent. Pistillate tepals 4 or occasionally 5, ovate to orbicular, ca. 2 mm. long, slightly more than 1 mm. wide. Styles 3, 2-parted, with the papillate stigmatic surface forming spiral bands. Ovary 3-celled, placentae variable. Capsule glabrous, 4–6 mm. long, the largest wing mostly obtuse, to 1 cm. wide, the other two subequal, narrow, seeds stalked, oblong, obtuse, truncate at base.

Costa Rica and Panama to Colombia.

CANAL ZONE: Mamei, alt. 10–30 m., *Pittier 2251*; forest between Frijoles and Monte Lirio, alt. 30 m., *Killip 12143*; along small rivulet in forest, Gatún, *Ostenfeld 84*; Las Cascadas Plantation, near Summit, *Standley 25706, 25723, 29512*; Cerro Gordo, near Culebra, *Standley 26003*; hills west of the canal, near Gatún, *Standley 27222*; hills north of Frijoles, *Standley 27568*; Gamboa, *Standley 28406*; Río Paraíso, above East Paraíso, *Standley 29882*; vicinity of Fort Sherman, *Standley 30952*; Obispo, *Standley 31743*; Barro Colorado Island, Gatún Lake, *Standley 40909, 41020, Woodworth & Vestal 391*; drowned forest of Quebrada Culebra, alt. 70–75 m., *Dodge & Allen s. n.*; between Madden Dam and Saddle 11, near Alahuela, alt. 90–100 m., *Dodge, Steyermark & Allen 16504*; on tree, drowned forest along Río Chagres between junction with Río Pequení and Río Indio, alt. 66 m., *Steyermark & Allen 16795*. CHIRIQUÍ: vicinity of San Félix, alt. 0–120 m., *Pittier 5215*. COLÓN: wooded swamp between France Field and Catival, *Standley 30194*. DARIÉN: vicinity of Pinogana, alt. 20 m., *Allen 937*. PANAMÁ: along Chavaré River, near Chepo, alt. 50–200 m., *Pittier 4713*; rocky banks of Pacara River, *Killip 3156*; wet forest, Río Tapía, *Standley 26155, 28234*; Taboga Island, *Standley 27888*; moist forest, Río Tecumen, *Standley 29411*; San José Island, *Johnston 108*.

17. BEGONIA FISCHERI Schrank var. TOVARENSIS (Kl.) Irmscher, Bot. Jahrb. 76: 23. 1953.

Begonia tovarensis Kl. in Abh. Akad. Berlin 1854:31. 1855.
Begonia populifolia sensu Liebm. in Kjoeb. Vidensk. Meddel. 1852:16. 1853, non HBK. 1825.
Begonia moritziana Kl. in Abh. Akad. Berlin 1854:31. 1855, non Kunth & Bouché, 1848.
Begonia tovarensis β ocanensis A. DC. in DC. Prod. 15^1:303. 1864.
Begonia ciliibracteola C. DC. in Smithson. Misc. Coll. 69: no. 12:5. 1919.

Herbaceous, 2–12 dm. high, sparsely brown-pilose to glabrous. Stem erect, red, branches short. Leaves more or less asymmetric, broadly ovate or suborbicular, acute or rounded, cordate at base, 2–9 cm. long, palminerved, crenate-serrate, ciliate, glabrous above, more or less brown-pilose beneath especially on the nerves, petioles 5–45 mm. long, stipules deciduous, ovate-oblong, to 10 mm. long, ciliate-serrulate. Peduncles axillary, 15–55 mm. long. Cymes bisexual, few-flowered. Bracts persistent, ovate, 2–4 mm. long, fimbriate. Pedicels 5–20 mm. long. Staminate tepals 4, the outer orbicular, 8 mm. long, the inner smaller, narrowly obovate. Stamens free, numerous, filaments short, anthers oblong, the connective produced, obtuse. Pistillate bracteoles like the bracts. Pistillate tepals 5, obovate, 3–6 mm. long. Styles 3, bifid, the stigmatic tissue linear, spiral, continuous, placentae bilamellate, ovuliferous throughout. Capsule 10–15 mm. long, its wings decurrent, very unequal, the largest typically ascending and tapering, often hooked, to 23 mm. wide, seeds fusiform.

Cuba, Mexico, Central America, Colombia, Venezuela, Peru, Bolivia.

CANAL ZONE: Ahorca Lagarto to Culebra, *Cowell 388*; on marshy or floating island, Barro Colorado Island, *Kenoyer 460, Bailey 644, Woodworth & Vestal 696*. COCLÉ: shaded margins of marsh near Río Antón, floor of El Valle de Antón, alt. 600 m., *Allen 2777*. PANAMÁ: on grassy jams in lake, vicinity of Arenoso, lower Río Trinidad, alt. 26–50 m., *Seibert 617*.

18. BEGONIA OAXACANA A. DC. in DC. Prod. 15[1]:312. 1864.

Begonia oaxacana β pilosula A. DC. in DC. Prod. 15[1]:312. 1864.
Begonia luxii C. DC. in Bot. Gaz. 20:541. 1895.
Begonia serrulatoala C. DC. in Bull. Herb. Boiss. II. 8:321. 1908.
Begonia pubipedicella C. DC. in Smithson. Misc. Coll. 69: no. 12:7. 1919.

Herbaceous to suffruticose, terrestrial or epiphytic, suberect or climbing, very variable in all its parts, 3–15 dm. high. Stems 2–12 mm. thick, glabrous to pilose, green or red. Leaves transverse or oblique or rarely some almost straight, broadly or narrowly ovate, acuminate, palmately 5–7-nerved, cordate at base, slightly or usually not at all lobed, 6–18 cm. long, 3–11 cm. wide, serrulate, sparsely hirsute on both sides or nearly glabrous above, thin, petioles slender, 4–15 cm. long, sparsely hirsute to glabrous, stipules deciduous, oblong, 12 mm. long, setose-mucronate, entire. Peduncles axillary, 2–5 cm. long. Cymes few-flowered, bisexual. Bracts tardily deciduous, broadly ovate or suborbicular, obtuse, 6–12 mm. long, entire. Pedicels 10–15 mm. long. Staminate tepals 4, the outer suborbicular or broadly ovate, 10–15 mm. long, pink, glabrous or at times somewhat pubescent, the inner slightly shorter, obovate, white. Stamens free, numerous, the filaments longer than the obovoid anthers. Pistillate bracteoles wanting or quickly deciduous. Pistillate tepals 3, the outer two suborbicular, 8–14 mm. long, the inner one much smaller, narrowly obovate or oblong. Ovary 2–3-celled, placentae bifid, ovuliferous on all sides, styles 3, short-connate, bilobed, the stigmatic surface linear, spiral, continuous. Capsule erect, broadly elliptic, 10–15 mm. long, hirsute to glabrous, wings 3 or sometimes up to 6, subequal, narrow, angled at middle or somewhat above giving the fruit a rhombic or obovate outline, entire to fimbriate-serrulate, seeds ellipsoid, broadly obtuse, short-stalked.

Southern Mexico, Guatemala, Panama.

CHIRIQUÍ: humid forest of Cuesta de Las Palmas, southern slope of Cerro de la Horqueta, alt. 1700–2100 m., *Pittier 3248*; rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 55*; vicinity of Casita Alta, Volcán de Chiriquí, alt. 1500–2000 m., *Woodson, Allen & Seibert 959*; Bajo Mono, Robalo Trail, western slopes of Cerro Horqueta, alt. 1500–2100 m., *Allen 4809*.

19. BEGONIA UDISILVESTRIS C. DC. in Smithson. Misc. Coll. 69: no. 12:9. 1919.

Herbaceous, 1 m. high, branching, completely glabrous except for a ring of trichomes at the apex of the petiole. Leaves transverse or oblique, ovate, cordate at base, long-acuminate, palminerved, to 11.5 cm. long, serrulate, petioles slender, to 11 cm. long, verruculose, stipules deciduous. Cymes few-flowered, regular, about equaling the leaves or shorter. Bracts deciduous, entire. Staminate tepals 4, entire, the outer suborbicular, 5 mm. long, the inner narrowly obovate, shorter.

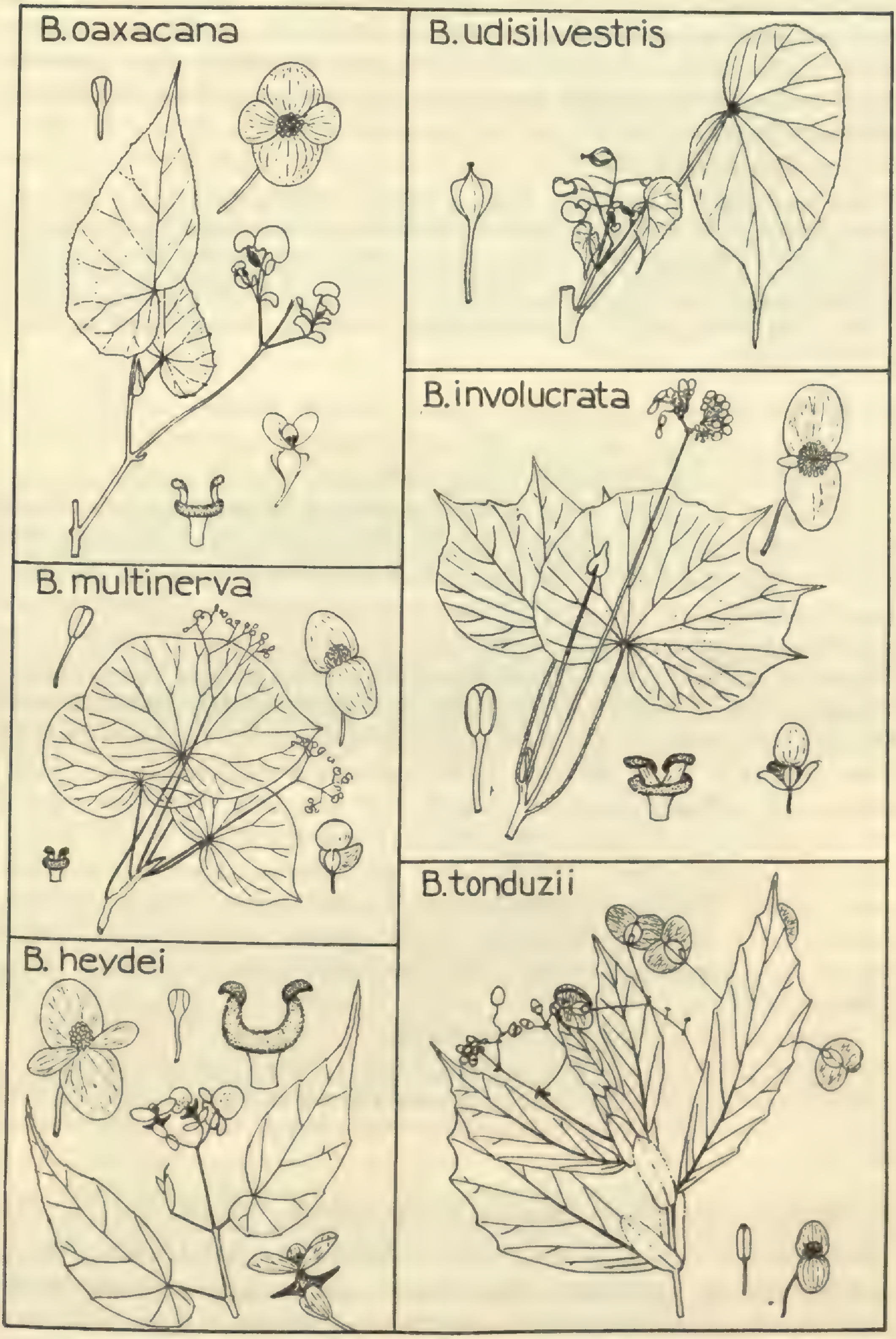

Fig. 18. ***Begonia***

Stamens free, anthers oblong, shorter than the filaments. Pistillate tepals 3, the outer two suborbicular, 5 mm. long, the inner one much smaller and narrower. Ovary 3-celled, placentae bilamellate, ovuliferous throughout, styles deciduous, connate at base, bifid. Capsule erect, ovoid, attenuate into a slender beak, wings equal, very narrow.

Costa Rica and Panama.

BOCAS DEL TORO: Robalo Trail, northern slopes of Cerro de la Horqueta, alt. 1800–2100 m., *Allen 4938*. CHIRIQUÍ: humid forest of Cuesta de Las Palmas, southern slope of Cerro de la Horqueta, alt. 1700–2100 m., *Pittier 3249*; Volcán de Chiriquí, Boquete District, alt. 2700 m., *Davidson 1025*; trail from Cerro Punta to headwaters of Río Caldera, alt. 2250–2500 m., *Allen 1440*; Casita Alta to Cerro Copete, alt. 2300–3300 m., *Woodson & Schery 349*; Portrero Muleto to summit, Volcán de Chiriquí, alt. 3500–4000 m., *Woodson & Schery 444*.

20. BEGONIA INVOLUCRATA Liebm. in Kjoeb. Vidensk. Meddell. 1852:15. 1853.

Begonia broussonetiifolia A. DC. in Ann. Sci. Nat. IV. 11:133. 1859.
Begonia laciniosa A. DC. in DC. Prod. 15^1:340. 1864.

Fruticose, 1–2 m. high. Stem fulvous-tomentose or becoming glabrous. Leaves oblique, cordate at base, 2–5-lobed at apex with acuminate points, 15–28 cm. wide, to 20 cm. high, denticulate, evenly pilosulous above, more densely on the nerves beneath, petioles 12–18 cm. long, fulvous-tomentose or becoming glabrous, stipules deciduous, ovate, setose-apiculate, 14–25 mm. long, entire, brown, membranaceous, glabrous or sparsely pilose. Peduncles axillary, exceeding the leaves, fulvous-tomentose becoming glabrous. Cymes many-flowered, dense, their primary branches short and their ultimate branches so nearly aborted that the inflorescence appears almost umbellate. Bracts deciduous, entire, the outer ovate, ample and completely enclosing the young inflorescence. Pedicels 5–25 mm. long. Staminate tepals 2, suborbicular, 6–11 mm. long, entire, sparsely pilose to glabrous, white. Stamens numerous, anthers oblong, about equaling the filaments, connective produced, broadly obtuse. Pistillate bracteoles lacking. Pistillate tepals 2, like the staminate. Ovary 3-celled, placentae bilamellate, styles connate at base, bifid. Capsule ellipsoid, very unequally 3-winged, the largest wing elliptic or falcate, obtuse, 8–10 mm. wide.

Guatemala, Nicaragua, Costa Rica, Panama.

CHIRIQUÍ: moist shaded places, valley of the upper Río Chiriquí Viejo, alt. 1300–1900 m., *White 34*; rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 108*; vicinity of "New Switzerland", central valley of Río Chiriquí Viejo, alt 1800–2000 m., *Allen 1349*.

21. BEGONIA MULTINERVIA Liebm. in Kjoeb. Vidensk. Meddell. 1852:18. 1853.

Begonia cuspidata C. DC. ex Th. Dur. & Pittier in Bull. Soc. Bot. Belg. 35^1:260. 1896.

Suffruticose, 2–3 m. high. Stem flexuous with elongate internodes, brown-pilose. Leaves transversely elliptic, abruptly acute, cordate at base, palminerved, 12–22 cm. long, entire, glabrous, petioles divergent, 6–16 cm. long, brown-pilose, stipules deciduous, lance-oblong or narrowly triangular, setose-acute, 2–3 cm. long,

entire, membranaceous. Peduncles axillary, 15–38 cm. long, exceeding the leaves, sulcate, soon glabrous. Cymes bisexual, regularly dichotomous, 12–25 cm. broad, glabrous. Bracts deciduous, suborbicular, entire, the lowest 17 mm. long. Pedicels 7–15 mm. long. Flowers white. Staminate tepals 2, broadly ovate or suborbicular, 8 mm. long, entire. Stamens numerous, anthers obovoid, shorter than the filaments, connective scarcely if at all produced. Pistillate bracteoles lacking. Pistillate tepals 2, like the staminate. Ovary 3-celled, placentae bilamellate, ovuliferous throughout, styles much connate at base, bifid, the stigmatic tissue linear, spiral, continuous. Capsule subglobose, 7 mm. long, wings very unequal, the largest ovate or elliptic, to 14 mm. wide, the others narrowly lunate, seeds stalked, ellipsoid.

Costa Rica, Panama.

CHIRIQUÍ: between Hato del Jobo and Cerro Vaca, eastern Chiriquí, alt. 700–1000 m., *Pittier 5420*.

22. BEGONIA URTICAE L. f. Suppl. 420. 1781.

Begonia urticifolia J. E. Smith, Pl. Icon. Ined. 2: *pl. 45*. 1790, pro errore.
Begonia columnaris Benth. Pl. Hartweg. 131. 1844.
Begonia trachyptera Benth. Pl. Hartweg. 184. 1845.
Stiradotheca trachyptera Kl. in Monatsber. Akad. Berlin 127. 1854.
Begonia coccinea Ruiz ex Kl. in Monatsber. Akad. Berlin 127. 1854, e. p., nomen in synon.
Sassea urticae Kl. in Monatsber. Akad. Berlin 128. 1854.
Sassea columnaris Kl. in Monatsber. Akad. Berlin 128. 1854.
Begonia glabra Ruiz ex Kl. in Monatsber. Akad. Berlin 128. 1854, nomen in synon.
Casparya coccinea Kl. in Abh. Akad. Berlin 1854:128. 1855.
Stibadotheca trachyptera Kl. in Abh. Akad. Berlin 1854:131. 1855.
Sassea glabra Kl. in Abh. Akad. Berlin 1854:134. 1855.
Begonia cucullata Ruiz ex Kl. in Abh. Akad. Berlin 1854:134. 1855, nomen in synon.
Casparya trachyptera A. DC. in DC. Prod. 15^1:274. 1864.
Casparya columnaris A. DC. in DC. Prod. 15^1:274. 1864, non Kl. 1854.
Casparya columnaris β glabra A. DC. in DC. Prod. 15^1:274. 1864.
Casparya urticae A. DC. in DC. Prod. 15^1:274. 1864.
Casparya urticae β hispida A. DC. in DC. Prod. 15^1:274. 1864.
Sassea hoffmanniana Kl. ex A. DC. in DC. Prod. 15^1:275. 1864, nomen in synon.
Begonia monticola C. DC. in Bull. Herb. Boiss. II. 8:325. 1908.
Begonia torresii Standl. in Journ. Wash. Acad Sci. 17:313. 1927.
Begonia chiriquensis Standl. in Woodson & Schery in Ann. Mo. Bot. Gard. 27:321. 1940.
Begonia columnaris var. *glabra* Smith & Schubert in Macbride, Fl. Peru, in Field Mus. Pub. Bot. 13^4:187. 1941.

Herbaceous to suffruticose. Stem branching, decumbent, rooting at the nodes, 15–40 cm. high or rarely to 2 m., the younger parts usually ferruginous-puberulent. Leaves straight or nearly so, strongly asymmetric, ovate or elliptic, acute or acuminate, base acute on the adaxial side, obtuse and decurrent on the other, 3–8 cm. long, penninerved, doubly serrate, ciliate, sparsely hirtellous to glabrous above, densely pubescent on the nerves to wholly glabrous beneath, petiole 2–15 mm. long, stipules deciduous, ovate, obtuse, setose, 2–6 (rarely to 12) mm. long. Peduncles axillary, erect, 12–45 mm. long, 1- to few-flowered. Bracts deciduous, elliptic, setaceous-dentate at apex. Pedicels 6–18 mm. long. Staminate tepals 4, subequal, 3–8 mm. long, the outer elliptic, entire, red, often pilose, the inner obovate, white. Stamens on a slender column 2 mm. high, filaments short, anthers linear, the con-

nective slightly produced. Pistillate bracteoles deciduous, elliptic. Pistillate tepals 5, subequal, elliptic, 3–5 mm. long, entire, red or white, the outer often pilose. Styles 3 with many short branches wholly covered by stigmatic papillae, placentae bilamellate, ovuliferous on all sides. Capsule very variable, broadly turbinate, obtuse at base, with 3 ascending horns on the angles, the tips of the horns often deciduous, the apical column well developed, angled or terete, slender, conical or cylindrical or subclavate, from longer than the horns to rarely shorter.

Costa Rica to Peru.

BOCAS DEL TORO: along streams, Robalo Trail, northern slopes of Cerro de la Horqueta, alt. 1800–2100 m., *Allen 4980*. CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 107*; epiphytic, trail from Cerro Punta to headwaters of Río Caldera, alt. 2250–2500 m., *Allen 1435*; vicinity of Cerro Punta, alt. 2000 m., *Allen 3484*.

23. BEGONIA HEYDEI C. DC. in Bot. Gaz. 20:540. 1895.

Begonia pittieri C. DC. in Bull. Herb. Boiss. II. 8:316. 1908.
Begonia triloba C. DC. in Bull. Herb. Boiss. II. 8:322. 1908.

Erect, to 6 dm. high, branching with elongate internodes, glabrous. Leaves oblique, cordate at base, narrowly ovate, acuminate, penninerved, 6–10 cm. long, 2–3.5 cm. wide, remotely denticulate, petioles 10–34 mm. long, stipules deciduous, lance-ovate, subulate, 5 mm. long. Peduncles axillary, 15–28 mm. long. Cymes few-flowered, exceeded by the leaves. Bracts deciduous. Pedicels 8–10 mm. long. Staminate tepals 4, entire, obtuse, the outer ovate or elliptic, 7 mm. long, setose toward base, the inner slightly shorter. Stamens many on a short column, anthers obovate, nearly equaling the filaments. Pistillate bracteoles elliptic, entire, about equaling the ovary. Pistillate tepals 3, elliptic or obovate, entire, setose toward base. Ovary 3-celled, placentae simple, styles deciduous, connate at base, bifid. Capsule rhomboidal, attenuate at base, bearing three equal slender acuminate horns 9–11 mm. long.

Guatemala, Costa Rica, Panama.

COCLÉ: epiphytic, vicinity of El Valle de Antón, alt. 600 m., *Allen 2078*; epiphytic, La Mesa, *Allen 2722*.

24. BEGONIA TONDUZII C. DC. in Bull. Soc. Bot. Belg. 35^1:264. 1896.

Begonia allenii Standl. in Woodson & Seibert in Ann. Mo. Bot. Gard. 25:830. 1938.

Caulescent, 28–48 cm. high. Stem erect, simple or rarely few-branched, woody at least toward base, rufous-pilose becoming glabrous with age, internodes mostly short but distinct. Leaves nearly straight, strongly asymmetric, oblanceolate, penninerved, acuminate, cuneate, falcate, 6–12 cm. long, 2–5 cm. wide, coarsely sinuate-dentate near apex, glabrous or pilose on the midnerve beneath, petioles 5–9 mm. long, pilose to glabrous, stipules more or less persistent, broadly ovate, setose-acuminate, 10–25 mm. long, entire, thin. Peduncles few, axillary, 3–7 cm. long. Cymes few-flowered, regular, rather dense, pilose at first. Bracts persistent, small, suborbicular, serrate. Pedicels 5–16 mm. long. Flowers pink or red. Staminate tepals 2, broadly ovate, 5–8 mm. long, more or less pubescent. Stamens free,

anthers oblong, about as long as the filaments, connective produced, obtuse. Pistillate bracteoles like the bracts. Pistillate tepals 5, equal. Ovary 3-celled, placentae bilamellate, ovuliferous throughout, styles connate at base, stigmatic tissue linear, spiral, continuous. Capsule erect, subglobose, wings subequal, very variable in width.

Costa Rica, Panama.

COCLÉ: El Valle de Antón, along Río Indio trail, alt. 500–700 m., *Hunter & Allen 327*; north rim, vicinity of El Valle, *Allen 234, 1663*; banks along trail to La Mesa, hills north of El Valle de Antón, alt. 800–1000 m., *Allen 2286*; Cerro Pajita, hills north of El Valle de Antón, alt. 1000–1200 m., *Allen 4174*.

25. BEGONIA OPULIFLORA Putz. in Fl. des Serres I. 10: *pl. 995*. 1854-55.

Suffruticose, branching, over 1 m. high, glabrous. Leaves straight, strongly asymmetric, ovate or elliptic, acute, 8–9 cm. long, rounded at base, pinnate, subulate-dentate, petioles much shorter than the blades, stipules oblong-cordate,

Fig. 19. ***Begonia opuliflora***

long-aristate, membranaceous. Peduncles axillary, about 15 cm. long. Inflorescences umbelliform, globose, 50–60-flowered. Pedicels elongate. Flowers white. Staminate tepals 4, subequal, broadly elliptic, obtuse, entire. Stamens about 30, slightly connate at base, anthers oblong. Pistillate tepals 5, oblong or lance-oblong, subacuminate. Styles 3, connate, stigmatic tissue lunate. Fruit 3-winged, the wings very unequal, the largest much wider than high, twice the width of the others.

Endemic

COCLÉ: Described from cultivation from the former Province of Soto which centered on Penonomé.

26. BEGONIA GUADUENSIS HBK. Nov. Gen. & Sp. 7:178. 1825.

Begonia ottonis Walpers, Repert. Bot. Syst. 2:212. 1843.
Begonia walpersii Heynh. Nom. 2:63. 1846.
Donaldia ottonis Kl. in Monatsber. Akad. Berlin 127. 1854, nomen.
Begonia laurina Hort. ex A. DC. in DC. Prod. 15^1:292. 1864, nomen in synon.
Begonia serratifolia C. DC. in Smithson. Misc. Coll. 69: no. 12:7. 1919.

Suffruticose, scandent to 2 m. high, glabrous. Stem erect, branched. Leaves straight, asymmetric, pinnate-nerved, lanceolate to elliptic-lanceolate, acute or acuminate, unequal at base with the adaxial side cuneate and the other rounded and decurrent, 5–9 cm. long, 16–40 mm. wide, doubly crenate-serrate, ciliate, membranaceous, petiole 2–8 mm. long, stipules deciduous or subpersistent, oblong-ovate, acuminate-setiferous, 8–10 mm. long, scarious. Peduncles terminal and axillary, 4–5 cm. long. Cymes dichotomous, few- to many-flowered, 6–15 cm. in diameter. Bracts deciduous or subpersistent, ovate, obtuse, acute or mucronate, 4–7 mm. long, scarious. Pedicels 4–19 mm. long. Flowers pinkish white. Staminate tepals 4, the outer elliptic-ovate, entire or dentate at apex, 8–15 mm. long, the inner obovate, distinctly shorter. Stamens free, very numerous, anthers oblong, mostly shorter than the filaments, connective produced, apiculate or obtuse. Pistillate bracteoles deciduous, ovate to narrowly obovate, 6 mm. long, entire. Pistillate tepals 5, subequal with the two outer slightly smaller, elliptic, acute, 6–10 mm. long. Styles 3, bifid nearly to base, each main branch with 3–4 short spiral branches, placentae bifid, ovuliferous throughout. Capsule ellipsoid, the largest wing triangular, horizontal or slightly ascending, 15 mm. wide, the other two marginiform.

Panama, Colombia, Venezuela.

CANAL ZONE: side cuts, railroad relocation between Gorgonas and Gatún, alt. 10–50 m., *Pittier 2258*; drowned forest of Quebrada Culebra, alt. 70–75 m., *Dodge & Allen*; westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen*; near Madden Dam at Alahuela, alt. 70 m., *Dodge, Steyermark & Allen 16822*; forest along telephone trail between the Río Indio Hydrographic Station and the Natural Bridge of the Río Puente, *Dodge & Allen 17481*; drowned forest of Quebrada Ancha, alt. 70 m., *Dodge & Steyermark*. CHIRIQUÍ: vicinity of San Félix, eastern Chiriquí, alt. 0–120 m., *Pittier 5126*. VERAGUAS: hills west of Soná, alt. 500 m., *Allen 1034*.

27. BEGONIA ESTRELLENSIS C. DC. in Bot. Gaz. 20:540. 1895.

Woody vine. Stem elongate, glabrous. Leaves pinnately veined, ovate-elliptic,

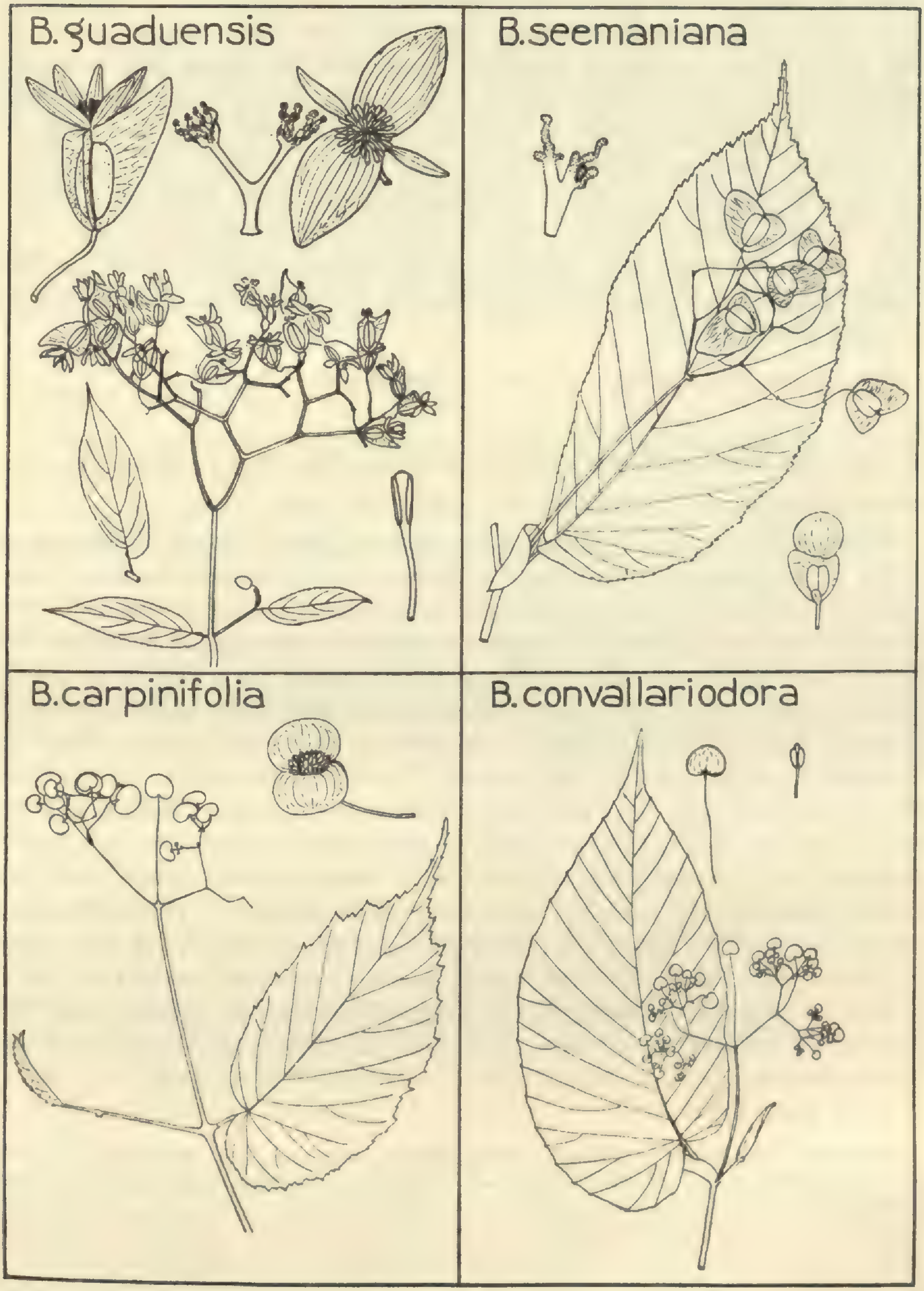

Fig. 20. *Begonia*

rather abruptly narrowed to a slender acumination (to 1 cm. long), acute to cuneate at base with the broader half produced 1 mm. beyond the narrower, remotely denticulate, glabrous, foveolate, 5–6.5 (–9.5) cm. long, 1.7–2.3 (–3.3) cm. wide, petioles to 12 mm. long, glabrous, stipules early deciduous, only scars seen. Inflorescences pedunculate and cymose, terminal and axillary. Staminate pedicels to 18 mm. long. Tepals regularly 4, the outer ovate, obtuse, to 6 mm. long and 5.5 mm. broad, the inner elliptic, to 5 mm. long and 2 mm. wide. Stamens numerous, free, the connective produced. Pistillate pedicels slender, glabrous, to 20 mm. long. Tepals 2, ovate, broadly acute, to 10 (–16) mm. long and 8 mm. wide. Ovary glabrous, puncticulate. Styles 3, bifid, broadly expanded above the base. Capsule unequally tri-alate, the largest wing to 10 mm. wide, ascending, acute.

Costa Rica, Panama.

COCLÉ: vicinity of El Valle, north rim, alt. 800–1000 m., *Allen 220*.

28. BEGONIA SEEMANNIANA A. DC. in Ann. Sci. Nat. IV. 11:133. 1859.

Begonia chiriquina C. DC. in Smithson. Misc. Coll. 69: no. 12:8. 1919.

Shrub to 3.5 m. high. Stem slender, glabrous, finely ribbed. Leaves asymmetric, elliptic-obovate, penninerved, serrulate-denticulate with setiferous teeth, acuminate, unequally obtuse at base with the broader side extended on the petiole beyond the narrower, glabrous to minutely puberulent throughout, foveolate, 9.5–14 cm. long, 4.5–6 cm. wide, petioles glabrous, rugose, 5–15 mm. long, stipules glabrous, ovate to elliptic, obtuse to acuminate and mucronate, truncate to nearly clasping at base, 15–25 mm. long, 4–6 mm. wide. Peduncles to 7 cm. long. Inflorescences cymose, terminal and axillary. Bracts inconspicuous, the staminate thin, elliptic, ca. 1 mm. long, the pistillate very early deciduous. Pedicels glabrous, slender, to 2 cm. long. Staminate tepals 2, ovate-obtuse to semi-orbicular, usually cordate at base, 5–6 mm. long, 3–8 mm. wide. Stamens numerous, free, with connectives produced and exceeding the shorter outer filaments. Pistillate tepals 2 (rarely a smaller third one present), obovate and obtuse to elliptic, 5–8.5 mm. long, 3–5.5 mm. wide. Ovary glabrous, sometimes with reddish dots on surface. Styles 3, bifid or irregular, essentially free. Capsule tri-alate, the largest wing with truncate obtuse apex, to 15 mm. wide, one wing marginiform, the third only slightly broader. Seeds obovoid or ellipsoid, less than 0.5 mm. long.

Costa Rica, Panama.

CHIRIQUÍ: humid forest of Cuesta de Las Palmas, southern slope of Cerro de la Horqueta, alt. 1700–2100 m., *Pittier*; vicinity of El Boquete, alt. 1000–1300 m., *Maxon 4948*; *Pittier 3152*.

29. BEGONIA CARPINIFOLIA Liebm. in Kjoeb. Vidensk. Meddel. 1852:20. 1853.

Herbaceous, suffrutescent or subscandent. Stem glabrous, green to reddish, finely ridged. Leaves obliquely ovate-acuminate to obliquely elliptic, obliquely obtuse at base with the broader half produced 1 mm. or more beyond the narrower,

glabrous, foveolate and prominently veined beneath, prominently serrate-denticulate with setiferous teeth, 5–7.5 (–11) cm. long, 2.5–3.7 (–4.7) cm. wide, petioles 3.5–10 mm. long, glabrous, stipules persistent, pinkish to greenish when fresh, linear to lanceolate or narrowly ovate with oblique base and acute apex, 7–13 mm. long, ca. 5 mm. wide. Inflorescences pedunculate, cymose, axillary and terminal. Bracts of the peduncles similar to the stipules, secondary bracts and bracteoles obovate to orbicular, obtuse to truncate. Pedicels glabrous, slender, to 1 cm. long in fruit. Staminate tepals 2, orbicular, cordate at base, 5–8 mm. long, 6–7 mm. wide. Stamens numerous, free, filaments of the outer ones shorter, connective produced. Pistillate tepals 2, chiefly orbicular, 3–6 mm. long, 4.5–5 mm. wide. Styles 3, short-connate. Capsule ca. 6 mm. high, its largest wing ascending, acute to obtuse, ca. 5 mm. wide, the other two marginiform and subequal. Seeds minute, slenderly obovoid.

Costa Rica, Panama.

CHIRIQUÍ: vicinity of "New Switzerland", central valley of Río Chiriquí Viejo, alt. 1800–2000 m., *Allen 1408*.

30. BEGONIA CONVALLARIODORA C. DC. in Bot. Gaz. 20:538. 1895.

Herbaceous, 1–15 m., scandent to erect. Stem slender, little branched, ribbed and glabrous, the internodes of the main axis 5.5–14 cm. long. Leaves pinnately veined, asymmetric, somewhat denticulate, obliquely elliptic, abruptly acuminate, the broader half usually produced into a conspicuous lobe at base, 8.5–15 cm. long, 4–7.5 cm. wide, petioles 12–40 mm. long, stipules membranaceous, obliquely elliptic, entire, acute and apiculate, truncate at base, 25 mm. long, 7 mm. wide. Peduncles 3–8 cm. long. Cymes regular, multi-flowered. Bracts early deciduous. Pedicels 6–16 mm. long. Tepals entire, white or pinkish, the staminate 2 (rarely 3 or 4), orbicular, cordate at base, 4–8 mm. long, the inner, when present, elliptic, 1–3.5 mm. long. Stamens numerous, anthers oblong-elliptic, usually equal to or longer than the filaments, connective produced, obtuse. Pistillate bracteoles soon deciduous, entire, elliptic, obtuse. Pistillate tepals 2 (rarely 3), orbicular to rounded-ovate, 6–9 mm. long, the third, when present, smaller. Styles 3, bifid. Placentae bilamellate, ovuliferous throughout. Capsule ellipsoid, 3-winged, the largest wing obtuse, 7–12 mm. broad.

Southern Mexico to Panama.

CHIRIQUÍ: valley of the upper Río Chiriquí Viejo, vicinity of Monte Lirio, alt. 1300–1900 m., *Seibert 207*; Bajo Mona, mouth of Quebrada Chiquero, along Río Caldera, alt. 1500–2000 m., *Woodson, Allen & Seibert 1015*; vicinity of Bajo Mona and Quebrada Chiquero, alt. 1500 m., *Woodson & Schery 533*; vicinity of Bajo Chorro, alt. 1900 m., *Woodson & Schery 647*. COCLÉ: epiphytic, vicinity of El Valle, alt. 600–1000 m., *Allen 1188, 1207*.

CACTACEAE

More or less massive and succulent, usually leafless terrestrial or epiphytic plants. Stems usually (except in *Pereskia*) phylloid and jointed, the joints elongate to suborbicular, terete to angled or flattened, the nodes with axillary areas (areoles) usually armed with spines, slender barbs (glochids) or hairs in various numbers and combinations, occasionally naked. Leaves alternate and laminate in *Pereskia*, but in the other genera minute and fugacious, or wholly lacking. Flowers pedunculate and in 1- to several-flowered panicles in *Pereskia*, in the other genera solitary and sessile, very large to very small, frequently nocturnal, epigynous (perigynous in *Pereskia*); perianth salverform or infundibuliform to rotate, with or without a conspicuous tube, monochlamydeous, actinomorphic when erect and more or less zygomorphic by position when horizontal or pendulous, the segments petaloid, usually white to red or yellow, relatively few to exceedingly numerous, the inner broader and more petaloid than the outer and lower, the tube naked or with bracts or areoles or both; stamens usually very numerous, with elongate filaments, inserted within the perianth tube or upon the ovary in rotate flowers; ovary inferior (subinferior in *Pereskia*), 1-celled, with few to several parietal placentas usually bearing numerous ovules, the style more or less elongate and filiform, with an elaborate radiate terminal stigma. Fruit a berry usually with numerous seeds immersed in succulent pulp.

The Cactaceae are a typically Western Hemisphere family, with only the genus *Rhipsalis*, the Mistletoe Cactus, doubtfully indigenous to the Old World. Species of *Opuntia*, however, especially *O. ficus-indica*, have been introduced since very early times and become naturalized in Africa and elsewhere. The genera vary in number according to the interpretation of individual authors, from only 20 (K. Schumann, in Engl. Nat. Pflanzenfam. III: 6. 1894) to over 100 (cf. Britton & Rose, in Carnegie Inst. Publ. No. 248. 1919–1923).

Much criticism has been made of the numerous segregate genera proposed by Britton and Rose and much undoubtedly remains to be learned of their natural relationships. In Panama, however, their genera usually are quite readily distinguishable into apparently natural groups; consequently they are adopted here without major modification. The controversy of "lumpers vs. splitters" in dealing with cacti dates at least as early as 1813, when Sims (in Curtis's Botanical Magazine 38: *sub pl. 1557*) inveighed against Haworth's generic segregates and advocated the return of both *Cereus* and *Opuntia* to the Linnaean genus *Cactus*, now long abandoned.

In humid Panama the cacti bear little resemblance as a rule to those so familiar in the landscapes of the arid regions of the United States and Mexico. Here they are mostly clambering semilianes on rocks, or epiphytes, with only two or three species of *Opuntia* and *Nopalea*, possibly introductions, to represent the Prickly Pears. *Pereskia* scarcely resembles a cactus at all, with its shrubby or tree-like habit, terete stems, and conspicuous leaves. Cacti of the *Rhipsalis* and *Cereus* alliances

often are encountered in Panama, but all to frequently in a sterile condition. This, together with the difficulty of preparing such succulent plants for the herbarium, accounts largely for the very few specimens found in museums. Actually, the species are not at all as rare as the few citations would indicate. The total number in Panama must be considerably greater than that of the present account.

a. Stems not phylloid; leaves conspicuous and laminate, deciduous; flowers pedunculate, often clustered, perigynous..... 1. PERESKIA
aa. Stems phylloid; leaves lacking or inconspicuous and fugacious; flowers sessile, solitary, epigynous.
b. Stem joints suborbicular to broadly linguiform in our species, entire, the areoles amphigenous, with glochids; perianth rotate to campanulate.
c. Petals erect, shorter than the stamens; stamen filaments not sensitive, erect at anthesis; style enlarged near the base into a disciform stylopodium. ..... 2. NOPALEA
cc. Petals spreading, longer than the stamens; stamen filaments sensitive, spreading at anthesis and inflexing upon stimulation; style only slightly thickened toward the base..... 3. OPUNTIA
bb. Stem joints elongate, terete to angled, or flattened and undulate or lobed, the areoles marginal upon the flowering joints, without glochids.
c. Flowers very large, rarely mediocre, with a definite perianth tube; stamens adnate to the perianth tube.
d. Flowering stem joints ribbed or angled, the areoles usually more or less spiny and bristly.
e. Stem joints usually 5-angled, with numerous large spines; plants terrestrial, the stems erect at first, but finally deflexed and rooting at the tips; perianth tube much longer than the segments, the adnate bracts inconspicuous and fugacious but with prominent spiny areoles..... 4. ACANTHOCEREUS
ee. Stem joints usually 3-angled, with inconspicuous and infrequent spines, or unarmed; plants clambering upon rocks or epiphytic, rooting laterally from the stem joints; perianth tube shorter than the segments.
f. Flowers very large; perianth tube with conspicuous and persistent bracts, not bristly or hairy..... 5. HYLOCEREUS
ff. Flowers mediocre; perianth tube with inconspicuous and fugacious bracts subtending conspicuous persistent bristly or hairy areoles..... 6. WEBEROCEREUS
dd. Flowering stem joints flat and leaflike, lobed or undulate, the areoles naked to minutely puberulent.
e. Flowers large, with an elongate perianth tube, the segments very numerous; stamens very numerous, the filaments many times longer than the anthers; stigma lobes numerous..... 7. EPIPHYLLUM
ee. Flowers mediocre or relatively small, with a rather short perianth tube, the segments about 10–20; stamens about 20–30, the filaments not greatly longer than the anthers; stigma lobes 3–5..... 8. WITTIA
cc. Flowers very small, without a definite perianth tube or the segments quite free; stamens adnate (in our species) to the margin of the hypanthium; flowering stem joints terete or essentially so, naked or with bristly or hairy areoles..... 8. RHIPSALIS

1. PERESKIA Mill.

PERESKIA Mill. Gard. Dict. ed. 4. 1754; Britton & Rose, in Carnegie Inst. Wash. Publ. no. 248. 1:8. 1919.

Carpophyllus Neck. Elem. Bot. 2:84. 1790, as *Carpophillus*.
Peireskia Mill. acc. to Steud. Nom. ed. 2. 2:282. 1841, var. typogr.

Leafy trees or shrubs, sometimes clambering; stems terete, branching, succulent above, woody below, armed with stout spines in minutely pubescent axillary areoles. Leaves alternate, spiral, broadly laminate, deciduous. Flowers pedunculate, paniculate or solitary, both terminal and axillary; perianth rotate, with many free or slightly united segments, the outer somewhat shorter and less petaloid than the inner; stamens numerous, inserted in a shallow tube adnate to the base of the perianth. Ovary subinferior. Fruit a fleshy relatively few-seeded berry bearing the marcescent remains of the perianth.

A genus of about a dozen species, ranging from Mexico and Florida to Argentina and in the Antilles. Very widely cultivated in the tropics and subtropics of the world and in greenhouses, and used as an under stock of grafted Zygocacti and Schlumbergeras. The plants far more resemble the northern Osage Orange in habit than a true cactus.

a. Clambering lianas; spines short and reflexed; berries globose, relatively small..... 1. P. ACULEATA
aa. Shrubs or small trees; spines elongate and straight; berries turbinate, relatively large..... 2. P. BLEO

1. PERESKIA ACULEATA Mill. Gard. Dict. ed. 8. 1768.

Cactus pereskia L. Sp. Pl. 469. 1753.
Cactus lucidus Salisb. Prodr. 349. 1796.
Pereskia longispina Haw. Syn. Pl. Succ. 178. 1812.
Pereskia aculeata β longispina (Haw.) DC. Prodr. 3:475. 1828.
Pereskia fragrans Lem. Hort. Univ. 2:40. 1841.
Pereskia undulata Lem. Illustr. Hort. 5: Misc. 11. 1858.
Pereskia pereskia (L.) Karst. Deutsch. Fl. 888. 1882; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 1:10. 1919.
Peireskia foetens Spegg. in Weingart, Monatsschr. Kakteenk. 14:134. 1904.
Pereskia godseffiana Hort. Sand. in Gard. Chron. III. 43:257. 1908.

Clambering shrubs or lianas; branches terete, relatively slender, about 3–10 m. long, with pairs of stout reflexed spines 2–5 mm. long. Leaves shortly petiolate, the blade variable, usually elliptic to obovate, obtuse to acuminate, the base obtuse to cuneate, 3–8 cm. long, 1.5–4.0 cm. broad, the petiole 3–5 mm. long. Flowers usually few or several in terminal or axillary panicles about twice as long as the subtending leaves; pedicels about 0.5–1.5 cm. long, accrescent in fruit; perianth white, yellowish, or pink, rotate, about 3–5 cm. in diameter, the segments rather numerous, the inner obovate-oblong, the outer oblong-linear; stamens numerous, less than half as long as the perianth segments; style rather stout, slightly longer than the stamens. Berry globose, 1.5–2.0 cm. in diameter, with inconspicuous thornless areoles, yellow or orange when ripe.

Antilles; Panama and Colombia; also reported from southern Florida and Mexico, perhaps as an escape. Frequently cultivated. In the British West Indies the fruits, known as Barbados Gooseberries, are eaten and made into preserves.

PANAMÁ: Cerro Campana, alt. 800 m., *Allen 3972*.

Fig. 21. ***Pereskia aculeata***

2. Pereskia bleo (HBK.) DC. Prodr. 3:475. 1828; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 1:17. 1919.

Cactus bleo HBK. Nov. Gen. & Sp. 6:69. 1823.
Pereskia panamensis Weber, in Bois, Dict. Hort. 739. 1898.

Shrubs or small trees to 4–7 m. tall; branches terete, rather stout, armed with few to several slender straight spines usually about 1 cm. long. Leaves rather long-petiolate, the blade usually elliptic-obovate, acuminate, cuneate, 4–20 cm. long, 2–7 cm. broad, the petiole 0.5–3.5 cm. long. Flowers usually few or solitary in terminal or axillary panicles shorter than the subtending leaves; pedicels about 5 mm. long; perianth pink to deep red, rotate, about 5–7 cm. in diameter, the segments rather numerous, the inner broadly obovate, the outer oblong-linear; stamens numerous, about half as long as the perianth segments; style rather stout, slightly longer than the stamens. Berry turbinate, 5–6 cm. long and broad, with several more or less persistent bracts, yellow when ripe.

Panama and northwestern South America. In Panama the plants are known as *ñajú de culebra* and *ñajú de espinas*. Britton and Rose found that the plants widely cultivated as *P. bleo* actually should be referred to *P. grandifolia* Haw., a native of Brazil.

Darién: trail between Pinogano and Yavisa, *Allen 281*; Marragantí, *Williams 661*; Cana, *Pittier 1884*. Panamá: Chepo, *Pittier 4704*. San Blas: Caledonia Harbor, *Elmore L34*.

2. NOPALEA Salm-Dyck

Nopalea Salm-Dyck, Cact. Hort. Dyck. 1849:63. 1850; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 1:33. 1919.

Massive succulent shrubs; stems phylloid and jointed when young, the joints fleshy, compressed, oval to oblong-elliptic, bearing amphigenous and rather sparse areoles armed with hairs and glochids and usually 1 to few stout spines, stoutly cylindric when older. Leaves inconspicuous, acicular, fugacious. Flowers sessile, solitary, chiefly marginal upon the young stem joints; perianth shortly campanulate, with a short and broad hypanthium, the segments rather few, the outer somewhat shorter and less petaloid than the inner, erect or very slightly spreading; stamens very numerous, the filaments much longer than the perianth, united in graded series at the base of the hypanthium in a shallow, glandular-dentate cup; ovary broadly turbinate, deeply concave, more or less tuberculate, the areoles very prominent; style longer than the stamens, enlarged shortly above the base into a conspicuous disciform stylopodium. Fruit a fleshy berry with numerous seeds.

About a dozen species of the Antilles and Central America. The two species of Panama, if they are species indeed, both appear to have been introduced, although Britton and Rose considered *N. dejecta* as "perhaps native in Panama."

a. Areoles without spines or nearly so; ovary and berries prominently tuberculate..... 1. N. cochenillifera
aa. Areoles with 2–8 stout spines; ovary and berries scarcely tuberculate..... 2. N. dejecta

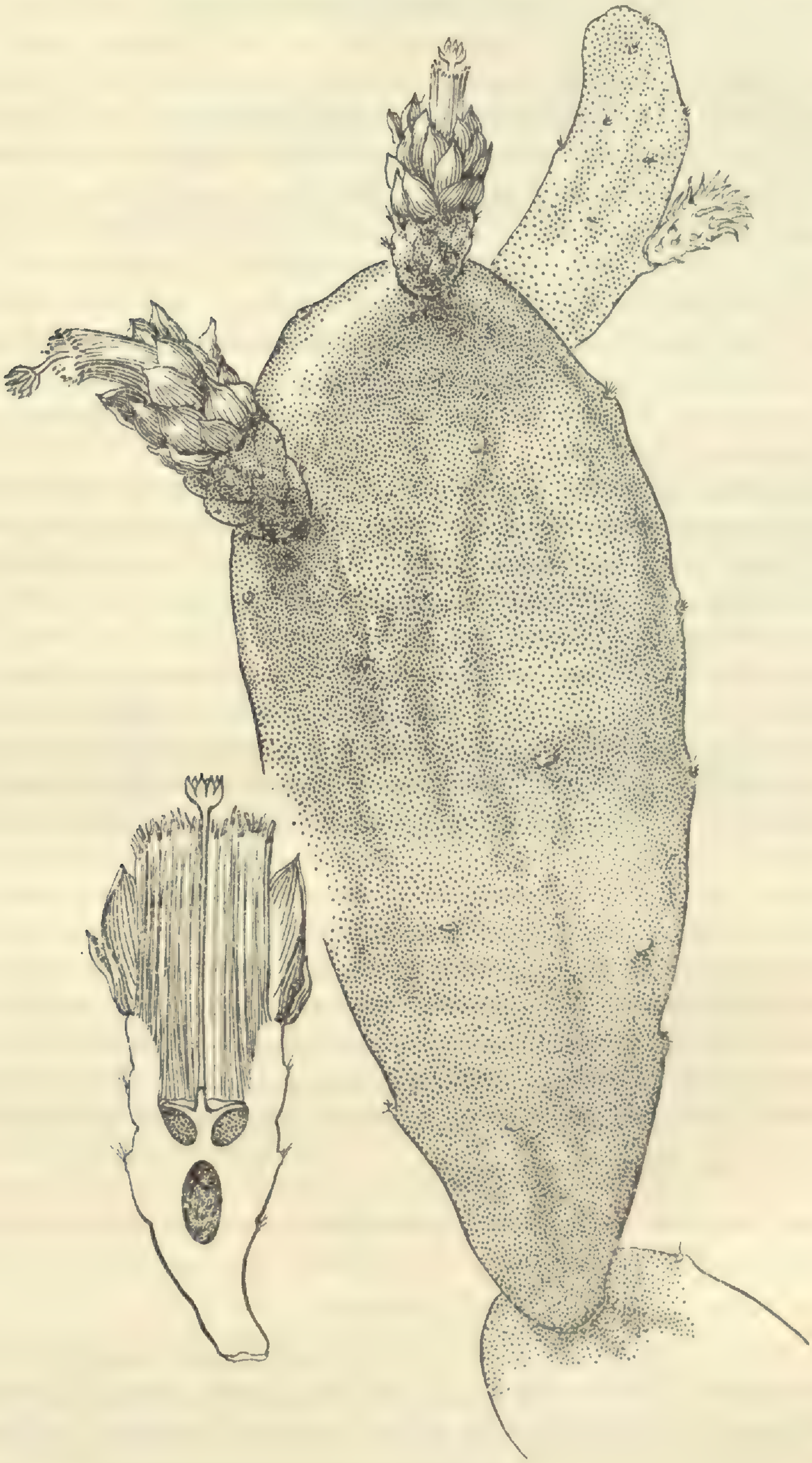

Fig. 22. ***Nopalea cochenillifera***

1. NOPALEA COCHENILLIFERA (L.) Salm Dyck, Cact. Hort. Dyck. 1849:64. 1850, as *coccinellifera*; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 1:34. 1919.

Cactus cochenillifer L. Sp. Pl. 468. 1753.
Opuntia cochinelifera (L.) Mill. Gard. Dict. ed. 8. 1768, sphalm.

Stout shrubs to 4 m. tall, the older trunks broadly cylindric, to 2 dm. thick, the young stem joints elliptic-oblong, to 5 dm. long, green, the areoles without spines or nearly so. Flowers pink to deep red, the perianth segments erect or nearly so, the outer 0.5–1.5 cm. long, deltoid, the inner broadly oblong-obovate, 1.5–2.5 cm. long, the hypanthium naked, broadly campanulate or urceolate, 1.0–1.5 cm. long, about 1 cm. broad at the orifice; staminal filaments 2.5–3.5 cm. long, pink; ovary 2–3 cm. long, about 1.5 cm. broad, oblong-turbinate, truncate and deeply concave, tuberculate, the areoles unarmed. Berry oblongoid-turbinate, about 5 cm. long, deep red when ripe.

Original habitat unknown, widely cultivated and escaped in tropical America. Occasionally encountered in cultivation or thickets in Panama, according to both Standley (Contr. U. S. Nat. Herb. 27:278. 1928) and Britton and Rose, but only one specimen of definitely Panamanian origin has been found during the preparation of the present account.

When the Spaniards arrived in Mexico in 1518 they found the natives using a brilliant purple, red, or orange dye, cochineal (Spanish, *cochinilla*), which they brushed from the surface of various cacti, particularly *Nopalea cochenillifera*. Their value quickly appreciated, the dye and the plants from which it was gathered were distributed by the Spaniards to other parts of their empire and to Spain itself as early as 1523.

It was not until the year 1703 that the microscope revealed the source of the dye to be a small coccid scale infesting the plants. The dye stuff was obtained by brushing the insects from the parasitized plant and roasting or boiling their bodies, which later were dried and pulverized for the vat. Until the invention of the aniline dyes cochineal was of enormous importance as a dye stuff, more than 6,000,000 pounds valued at about $4,000,000 being produced in 1868 by the Canary Islands alone. Little use of it is found at present since the dye is not permanent.

CANAL ZONE: Bas Obispo, *Verner in 1913*.

2. NOPALEA DEJECTA (Salm-Dyck) Salm-Dyck, Cact. Hort. Dyck. 1849:64. 1850; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 1:37. 1919.

Opuntia dejecta Salm-Dyck, Hort. Dyck. 361. 1834.

Shrubs 1–2 m. tall, the old trunks stoutly cylindrical, very spiny, the young stem joints narrowly elliptic-oblong, to 2 dm. long, bright green, the areoles with 2–8 stout spines. Flowers dark red to pink, the perianth segments erect or nearly so, the outer deltoid, 0.5–1.0 cm. long, the inner broadly oblong-obovate, 1.5–2.0 cm. long, the hypanthium naked, broadly campanulate, about 1 cm. long and 0.7 cm. broad at the orifice; staminal filaments dark red to pink, about 4 cm. long;

ovary broadly turbinate, truncate and deeply concave, 2.0–2.5 cm. long, 1.0–1.5 cm. broad, scarcely tuberculate, the areoles unarmed or with 1–2 short slender spines. Berry turbinate, 3–4 cm. long and broad, deep red when ripe.

Commonly cultivated and escaped in tropical America, suggested as "perhaps native in Panama" by Britton and Rose. Nevertheless, during the preparation of the present account only a single herbarium specimen from Panama was discovered.

CANAL ZONE: between Empire and Culebra, *Cowell 418a.*

3. OPUNTIA [Tourn.] Mill.

OPUNTIA [Tourn.] Mill. Gard. Dict. ed. 4. 1754.

Consolea Lem. Rev. Hort. 1862:174. 1862.
Tephrocactus Lem. Cact. 88. 1868.
Ficindica St. Lag. in Ann. Soc. Bot. Lyon 7:70. 1880.

Succulent shrubs, small trees, and subshrubs; stems phylloid and jointed when young, the joints fleshy, compressed and oval to broadly linguiform in our species, bearing amphigenous areoles armed with hairs, glochids, and spines, very rarely unarmed. Leaves inconspicuous, acicular and fugacious. Flowers sessile, chiefly marginal upon the young joints; perianth broadly campanulate, with a short and broad hypanthium, the segments numerous, the outer progressively shorter and less petaloid than the inner, widely spreading; stamens very numerous, the filaments much shorter than the perianth, united at different levels into a shallow glandular cup, somewhat deflexed at anthesis, sensitive and inflexed upon stimulation; ovary turbinate to cylindric, concave, the areoles prominent; style slightly longer than the stamens, terete to fusiform. Fruit a fleshy berry with numerous seeds.

Very many species, all indigenous to the Americas, but some, particularly O. *ficus-indica*, introduced and escaping in the dry tropics and subtropics of the Eastern Hemisphere where their exuberent growth has made them a serious pest in many areas. In Mexico, where the genus is most diversified and frequent, various species, particularly O. *ficus-indica* and O. *tuna*, are cultivated under the name of *nopal* and the fruits, called *tunas*, eaten as a delicacy. Although tunas are marketed in the United States, chiefly in the southwest, the large usually rather insipid berries have not attained much popularity.

1. OPUNTIA ELATIOR Mill. Gard. Dict. ed. 8. 1768; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 1:153. 1919.

Cactus nigricans Haw. Misc. Nat. 187. 1803.
Cactus elatior (Mill.) Willd. Enum. Hort. Berol. Suppl. 34. 1813.
Cactus tuna β elatior (Mill.) Sims, loc. cit. sub *pl. 1557.* 1813.
Cactus tuna γ nigricans (Haw.) Sims, in Curt. Bot. Mag. 38: *pl. 1557.* 1813.

Densely branched shrubs to 5 m. tall, the young stem joints narrowly obovate to suborbicular, to 4 dm. long, olive-green, the areoles 2–4 cm. apart, minutely hairy and with 1–8 unequal, terete-acicular brown black-tipped spines 1–7 cm. long. Flowers about 5 cm. in diameter, deep yellow more or less tinged with red or salmon, the inner segments obovate, mucronate, about 2 cm. long; staminal

filaments 1.5–2.0 cm. long, deeply tinged with red or salmon, yellow toward the base; ovary obovoid-turbinate, about 2 cm. long and broad, the areoles unarmed or nearly so. Berry obovoid, truncate, 4–5 cm. long, deep red when ripe.

Original habitat unknown; said to be frequent in Curaçao, coastal Colombia, and Panama (Britton & Rose), but definitely known stations in Panama at present are limited to the islands of the Gulf of Panama.

PANAMÁ: Taboguilla Island, *Howe 3792*; San José Island, on rocks of beach, *Erlanson 171*; locality indefinite, *Christopherson 207*.

4. ACANTHOCEREUS (Engelm. ex A. Berger) Britton & Rose

ACANTHOCEREUS (Engelm. ex A. Berger) Britton & Rose, in Contr. U. S. Nat. Herb. 12:432. 1909; in Carnegie Inst. Wash. Publ. No. 248. 2:121. 1920.

Cereus subsect. *Acanthocereus* Engelm. ex A. Berger, in Ann. Rep. Missouri Bot. Gard. 16: 75. 1905.

Succulent erect or clambering shrubs; stems phylloid and jointed, the joints elongate, rooting adventitiously at the tips, 3- to 5-angled, the areoles marginal on the angles, shortly pubescent and prominently spiny. Leaves very inconspicuous, acicular and fugacious or apparently wholly lacking. Flowers nocturnal, sessile, borne singly at the areoles; perianth large, subsalverform, with an elongate tube, the segments very numerous, the outer progressively shorter and narrower than the inner, widely spreading, the tube bearing several minute caducous bracts and prominent pubescent and spiny areoles; stamens very numerous, the filaments somewhat shorter than the perianth, united at progressively deeper levels to the hypanthium; ovary cylindric-ovoid, the areoles numerous and crowded, pubescent and spiny; style filiform, terete, somewhat shorter than the outer and upper stamens. Fruit a fleshy berry with numerous seeds.

A genus of about a dozen species, most frequent in Central America. A single species is recorded from Panama.

1. ACANTHOCEREUS PENTAGONUS (L.) Britton & Rose, in Contr. U. S. Nat. Herb. 12:432. 1909; in Carnegie Inst. Wash. Publ. No. 248. 2:123. 1920.

Cactus pentagonus L. Sp. Pl. 467. 1753.
Cactus pitajaya Jacq. Enum. Pl. Carib. 23. 1761.
Cereus pentagonus (L.) Haw. Syn. Pl. Succ. 180. 1812.
Cactus prismaticus Willd. Enum. Pl. Suppl. 32. 1813.
Cereus prismaticus (Willd.) Haw. Suppl. Pl. Succ. 77. 1819.
Cereus pitajaya (Jacq.) DC. Prodr. 3:466. 1828.
Cereus acutangulus Otto, in Pfeif. Enum. Cact. 107. 1837.
Cereus princeps Pfeif. loc. cit. 1837.
Cereus variabilis Engelm. in Boston Journ. Nat. Hist. 5:205. 1845, non Pfeif.
Cereus nitidus Salm-Dyck, Cact. Hort. Dyck. 1849:211. 1850.
Cereus vasmeri Young, Fl. Tex. 276. 1873.
Cereus dussii K. Sch. Gesamtb. Kakteen 89. 1897.
Cereus sirul Weber ex Gosselin, in Bull. Mus. Hist. Nat. Paris 10:384. 1904.

Clambering terrestrial shrubs, erect when young, soon arching and rooting at the tips of the stems and forming rather extensive clones, the young stem joints

Fig. 23. *Acanthocereus pentagonus*

elongate, rather slender, 3- to 5-angled, the areoles marginal on the angles, shortly pubescent and with few to several stout straight spines. Flowers very showy, the perianth tube 15–20 cm. long, about 5 mm. in diameter at the base, abruptly dilated near the orifice into a short obconic throat about 4 cm. in diameter, armed with rather sparse spiny areoles, the lobes widely spreading, white or the outer segments more or less suffused with greenish red, the inner oblanceolate, acute to acuminate, 4–7 cm. long; ovary cylindric-ovoid, truncate, about 2 cm. long, densely armed with spiny areoles. Berry oblong-ovoid, 4–5 cm. long, deep red when ripe, persistently spiny.

Forming thickets at the margins of beaches from the keys of Florida and the coast of Texas southward to Colombia and Venezuela; sporadically introduced in the Antilles and perhaps indigenous in Guadeloupe.

CANAL ZONE: vicinity of Miraflores Lake, *G. White 145*. PANAMÁ: Isla Taboga, *Woodson, Allen & Seibert 1490, Maxon & Valentine 6967*; Bella Vista, *Killip 12015*; Old Panamá, *Hitchcock in 1911*; Gorgona Beach, *G. White 154*.

5. HYLOCEREUS (A. Berger) Britton & Rose

HYLOCEREUS (A. Berger) Britton & Rose, in Contr. U. S. Nat. Herb. 12:428. 1909; in Carnegie Inst. Wash. Publ. No. 248. 2:183. 1920.

Cereus subgen. *Hylocereus* A. Berger, in Ann. Rep. Missouri Bot. Gard. 16:72. 1905.

Succulent shrubby root-climbers, frequently epiphytic; stems phylloid and jointed, rooting adventitiously at the nodes, the joints elongate, usually 3-angled, the areoles marginal on the angles, shortly pubescent and with infrequent and inconspicuous spines. Leaves inconspicuous and fugacious or wholly lacking. Flowers nocturnal, sessile, borne singly at the areoles; perianth large, broadly infundibuliform, the segments very numerous, the outer progressively shorter and less petaloid than the inner, the tube rather broad and somewhat shorter than the segments, bearing rather few conspicuous, persistent foliaceous bracts but without well-defined areoles; stamens very numerous, the filaments shorter than the perianth, united at progressively deeper levels to the hypanthium; ovary cylindric-ovoid, with few to numerous persistent accrescent foliaceous bracts but without well defined areoles; style filiform, somewhat longer than the stamens. Fruit a fleshy berry with numerous seeds.

About 20 species of Central America, northern South America, and the Antilles. Several species of *Hylocereus* are cultivated since they are amongst the most handsome of the Nightblooming Cereuses and some have escaped and naturalized in the tropics of the Old World.

a. Areoles unarmed or with few and inconspicuous spines; perianth tube and ovary with few and distant bracts; stigma lobes dichotomous..... 1. H. MONACANTHUS
aa. Areoles with several short stout spines; perianth tube and ovary with numerous imbricate bracts; stigma lobes entire..... 2. H. POLYRHIZUS

(Britton refers a sterile specimen collected by Cowell in Panama to *H. triangularis* but remarks "probably not native there, however." The stem joints of Cowell's specimen, which we have examined, are generally similar to those of *H. polyrhizus* but bear 8–10 spines at the areoles rather than the 3–5 usual for the latter species.)

Fig. 24. *Hylocereus monacanthus*

1. HYLOCEREUS MONACANTHUS (Lem.) Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 2:190. 1920.

Cereus monacanthus Lem. Hort. Univ. 6:60. 1845.

Succulent shrubby root-climbers, usually epiphytic, the young stem joints elongate, rather stout, usually sharply 3-angled, the areoles marginal on the slightly undulate angles, very minutely puberulent and occasionally with 1 to few inconspicuous spines. Flowers very showy, the perianth tube 12–15 cm. long, about 1 cm. in diameter at the base, abruptly dilating to a broadly obconic throat about 7 cm. long and broad, bearing few to several persistent foliaceous bracts 1–2 cm. long, the segments gradually spreading, greenish white, the inner rather broadly oblanceolate, subcaudate-acuminate, 12–15 cm. long; ovary cylindric-ovoid, 1.5–2.0 cm. long, persistent foliaceous bracts 0.2–1.0 cm. long, accrescent; stigma lobes dichotomous. Berry cylindric-ovoid, about 8 cm. long, unarmed save for the marcescent bases of the bracts.

Epiphytic in thickets and forested river banks, Panama and Colombia.

CANAL ZONE: Gatún, *Maxon 4689*; vicinity of Summit, *Bartlett & Lasser 17023*; Alhajuela, Chagres valley, *Pittier in 1911*. CHIRIQUÍ: east of Gualaca, alt. 500 ft., *Allen 5041*; Isla Parida, *Maxon 4904*. DARIÉN: Pinogana, *Pittier 6653*. PANAMÁ: Río Tataré, *Woodson & Schery 1021*; Bella Vista, *Killip 12030*; Tapía River, Juan Díaz region, *Maxon & Harvey 6705*; Urava Island, *Howe 31778*; Taboga Island, *Gaillard 2*.

2. HYLOCEREUS POLYRHIZUS (Weber) Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 2:185. 1920.

Cereus polyrhizus Weber, in Schum. Gesamtb. Kakteen 151. 1897.
Cereus trigonus var. *costaricensis* Weber, in Bull. Mus. Hist. Nat. Paris 8:457. 1902.
Hylocereus costaricensis (Weber) Britton & Rose, loc. cit. 186. 1920.
Cereus costaricensis (Weber) A. Berger, Kakteen 122. 1929.

Succulent shrubby root-climbers, frequently epiphytic, the young stem joints elongate, usually sharply 3-angled, the areoles marginal on the entire or slightly undulate angled, armed with several short stout spines. Flowers very showy, the perianth tube rather stout, 1.0–1.5 dm. long, about 1 cm. in diameter at the base, gradually dilating to a broadly obconic throat about 6 cm. in diameter at the orifice, bearing numerous persistent foliaceous bracts particularly imbricating toward the base, the segments gradually spreading, greenish white, the outermost tinged with purple, the inner rather broadly oblanceolate, acuminate, about 1.5–2.0 dm. long; ovary cylindric-ovoid, about 4 cm. long, the persistent foliaceous bracts numerous and imbricate, 1–2 cm. long; stigma lobes entire. Berry oblongoid, about 10 cm. long.

Colombia and Panama. "A common species on barren rocks, islets and cliffs along the coast [of San José Island], and frequent as an epiphyte, especially on the branches of *Bombax quinatum* in the interior of the island [I. M. Johnston, in Sargentia 8:217. 1949]."

PANAMÁ: San José Island, Perlas Archipelago, *Johnston 1126, Erlanson 172*; Old Panamá, *Rose & Rose 18506*.

Both Berger and Britton and Rose distinguish *H. polyrhizus* and *H. costaricensis* solely upon the thickness of the stem joints, whether (according to Britton & Rose) "only 3 to 4 cm. thick" or "5 to 10 cm. thick," respectively. The short descriptions of Britton and Rose are remarkably similar, differing almost solely in the position of identical adjectives. In this regard, Dr. Johnston's comments, partly quoted above, are very suggestive: "The plant varies in its form and appearance according to its particular habitat. On flat exposed rock surfaces it may be compact in growth, 1–3 dm. tall, and composed of short, stout, decumbent or ascending stems 3–6 cm. thick. Stems dangling from high branches or from the tops of cliffs usually are only 1–3 cm. thick but may become several meters or even more in length. Stems rooted on branches become flattened, as much as 10 cm. broad, and tend to wrap themselves about the support. The plant has typically 3-angled stems, but rarely 4-angled ones may be found." With such testimony, it appears entirely probable that *H. polyrhizus* and *H. costaricensis* are conspecific.

6. WEBEROCEREUS Britton & Rose

WEBEROCEREUS Britton & Rose, in Contr. U. S. Nat. Herb. 12:431. 1909; in Carnegie Inst. Wash. Publ. No. 248. 2:214. 1920.

Succulent shrubby root-climbers, frequently epiphytic; stems phylloid and jointed, rooting adventitiously at the joints, the joints elongate, rather indefinitely winged, occasionally nearly terete or flattened, the areoles marginal on the wings, very inconspicuously puberulent to essentially naked, seldom with extremely few and inconspicuous spines. Leaves apparently wholly lacking. Flowers nocturnal, sessile, of mediocre size in our species, borne singly at the uppermost areoles, very broadly infundibuliform, the tube very broad and somewhat shorter than the segments, bearing few to rather numerous broad fugacious bracts and conspicuous areoles armed with numerous slender subarachnoid bristles and hairs, the segments very numerous, the outer progressively shorter and less petaloid than the inner, spreading; stamens very numerous, the filaments shorter than the perianth, inserted at progressively deeper levels within the hypanthium; ovary cylindric, bearing crowded fugacious bracts and areoles armed with numerous persistent subarachnoid bristles and hairs; style filiform, somewhat longer than the stamens. Fruit a fleshy berry with persistent bristly areoles and numerous seeds.

Three or four questionably distinct species of Panama and Costa Rica.

1. WEBEROCEREUS PANAMENSIS Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 2:215. 1920.

Succulent epiphytic root-climbers, the young stem joints elongate, 4–7 mm. thick, rather indefinitely angled or winged and occasionally flat, the areoles marginal, inconspicuously indented, very inconspicuously puberulent to naked. Flowers mediocre, the perianth tube 2–3 cm. long, about 4 mm. in diameter at the base, immediately dilating to an obconic throat about 1 cm. in diameter at the orifice, bearing several fugacious deltoid bracts and areoles armed with slender

subarachnoid bristles and hairs, the segments suberect or slightly spreading, pale yellowish orange tinged with pink, apparently occasionally white, oblong-elliptic, 1.5–3.0 cm. long; ovary oblong-turbinate, truncate, about 1 cm. long, bearing minute fugacious bracts and persistent subarachnoid-bristly areoles. Berry broadly obovoid-turbinate, 2–3 cm. long, very prominently tuberculate, bright red when ripe.

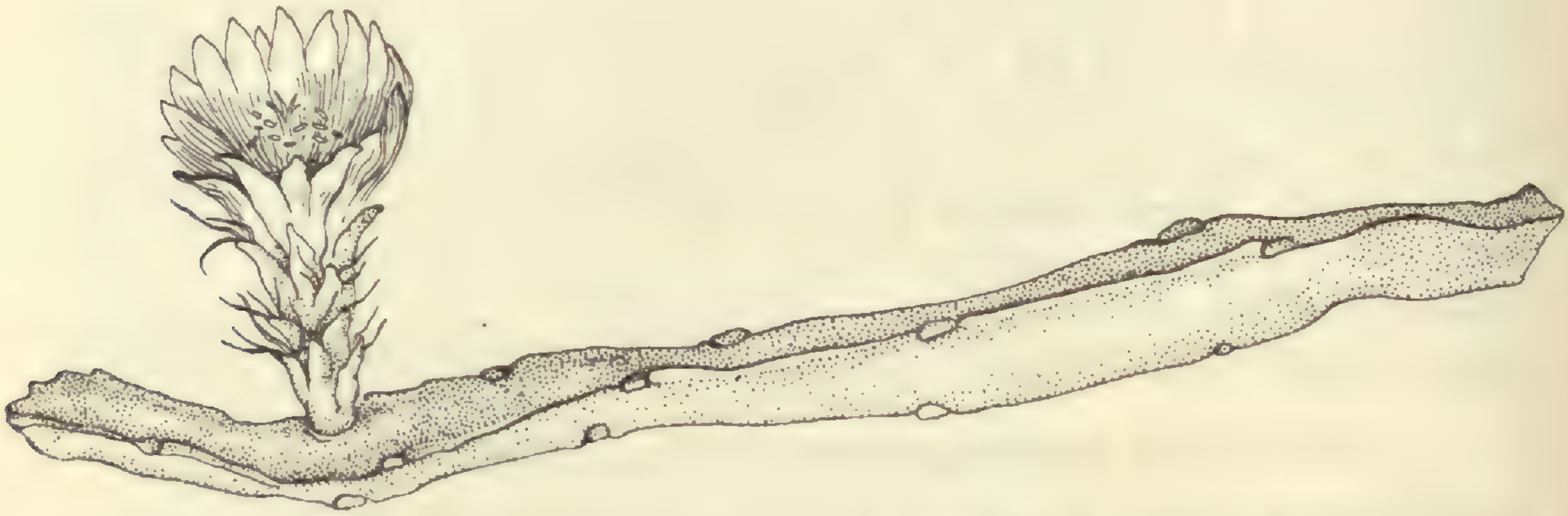

Fig. 25. *Weberocereus panamensis*

Lowland streamside forests and thickets, Panama.

COLÓN: near mouth of Río Chagres, *Allen 882*; along Río Fato, *Pittier 3903*. LOCALITY UNKNOWN: *Hunter 17040, 17041*.

The Hunter numbers, with only the comment "In long strands climbing over trees" have been determined previously as *Selenicereus inermis* (Otto) B. & R. They are quite sterile, however, consisting of older stems which are sharply 4-angled as a rule. Although we believe that they probably represent *W. panamensis* it is possible of course that such actually may not be the case. The flowering stem joints of *W. panamensis* which are before us are 2- to 3-angled.

7. EPIPHYLLUM [Hermann] Haw.

EPIPHYLLUM [Hermann] Haw. Syn. Pl. Succ. 197. 1812; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 4:185. 1923.

Phyllocactus Link, Handb. Erkenn. Gewächse 2:10. 1831.
Phyllocereus Miq. in Bull. Sci. Phys. Nat. Bruxelles 112. 1839.

Succulent shrubby plants, usually epiphytic root-climbers; stems phylloid and jointed, usually of two intergrading types: the primary terete or subterete, usually rooting, the secondary (flowering) flattened and leaf-like, lobed or undulate, the areoles marginal, naked or rarely minutely puberulent. Leaves lacking. Flowers nocturnal or ephemeral, sessile, borne singly at the areoles; perianth usually large, infundibuliform, the segments very numerous, the outer progressively shorter and less petaloid than the inner, reflexed or spreading, the tube relatively slender, usually longer than the segments, bearing usually few and sparse, inconspicuous

bracts, usually without definite areoles; stamens very numerous, the filaments somewhat shorter than the perianth and united at progressively deeper levels to the hypanthium; ovary frequently cylindric-ovoid, with few to numerous naked or rarely minutely puberulent areoles; style filiform, somewhat longer than the stamens. Fruit a fleshy berry with numerous seeds.

About 20 species of tropical America, with the greatest concentration in Central America. These are the species of Nightblooming Cereus usually cultivated as house plants in the United States. A characteristic growth pattern of most Epiphyllums is the differentiation of the stems into more or less terete, rooting primary joints and flattened, leaf-like secondary joints upon which the flowers eventually are borne. Areoles appear with geometric regularity upon the secondary joints, but are erratic upon the primary. The two basic types of joint may be combined in any way: a secondary proceeding from a primary, *vice versa*, a primary from a primary, or a secondary from a secondary.

a. Flowers very elongate and slender, the perianth tube 6 or more times longer than the segments; secondary (flowering) stem joints rather narrowly serrate, thick and callose-marginate in dessication, the areoles naked or indefinitely papillate..... 1. E. PHYLLANTHUS
aa. Flowers usually broad and massive, the perianth tube 2–3 (or less) times longer than the segments.
  b. Flowers relatively small and inconspicuous, about 8–15 cm. long, the perianth tube 2–3 times longer than the segments; secondary stem joints rather narrowly serrate, thick and callose-marginate in dessication, the areoles naked or indefinitely papillate..... 2. E. PITTIERI
  bb. Flowers large and handsome, the perianth tube less than twice as long as the segments.
    c. Flowers about 15–25 cm. long: primary stem joints rather slender and terete.
      d. Secondary stem joints rather narrowly serrate, thin in dessication, the areoles minutely puberulent; flowers about 15–20 cm. long. 3. E. LEPIDOCARPUM
      dd. Secondary stem joints deeply crenate, the areoles minutely puberulent; flowers about 20–25 cm. long..... 4. E. MACROPTERUM
    cc. Flowers about 40 cm. long; primary stem joints very stout and more or less winged or angled (secondary stem joints unknown)..... 5. E. GIGAS

1. EPIPHYLLUM PHYLLANTHUS (L.) Haw. Syn. Pl. Succ. 197. 1812; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 4:187. 1923.

Cactus phyllanthus L. Sp. Pl. 469. 1753.
Opuntia phyllanthus (L.) Mill. Gard. Chron. ed. 8. 1768.
Cereus phyllanthus (L.) DC. Prodr. 3:469. 1828.
Phyllocactus phyllanthus (L.) Link, Handb. Erkenn. Gewächse 2:11. 1831.
Rhipsalis phyllanthus (L.) K. Sch. in Mart. Fl. Bras. 4^2:298. 1890, in part, as to basinym.
Epiphyllum gaillardae Britton & Rose, in Contr. U. S. Nat. Herb. 16:240. 1913.
Phyllocactus gaillardae (Britton & Rose) Vaupel, in Monatsschr. Kakteenk. 23:87. 1913.

Succulent epiphytic shrubs, the primary stem joints terete, elongate, about 5 mm. thick when young, probably thicker when old, the secondary stem joints narrowly oblong-elliptic to linear-elliptic, usually obtuse to rounded at the tip, cuneately decurrent into a terete subpetiolar base, 3–5 dm. long, 2–8 cm. wide, rather narrowly serrate, thick and callose-marginate in dessication, the areoles 3–5 cm. distant, naked or indefinitely papillate, borne superficially upon the upper broad margin of the serrations. Flowers nocturnal, very elongate and slender, white,

Fig. 26. *Epiphyllum phyllanthus*

the perianth tube about 18–25 cm. long, narrowly tubular, about 3 mm. in diameter at the base, abruptly dilated into an extremely short conic throat about 8 mm. broad at the orifice, bearing very few distant and inconspicuous external bracts, the perianth segments very narrowly oblong-elliptic, acuminate, spreading, the inner about 3–4 cm. long, the ovary oblongoid, inconspicuously tuberculate. Berry oblong-turbinate, truncate, somewhat tuberculate-angulate, about 7–8 cm. long and 2 cm. broad, bright red when ripe.

Costa Rica to Brazil, Bolivia and Paraguay.

CANAL ZONE: Quebrada Culebra, Madden Lake, *Dodge & Allen 17056*. COCLÉ: hills north of El Valle, alt. 1000 m., *Allen 2334*; Penonomé, *Williams 423*. COLÓN: Porto Bello, *Pittier in 1912*. DARIÉN: headwaters of Río Chico, alt. 500–750 ft., *Allen 4609*. PANAMÁ: vicinity of Pacora, alt. 40 m., *Allen 2241*; Juan Díaz, *Maxon & Harvey 6706*.

2. EPIPHYLLUM PITTIERI (Weber) Britton & Rose, in Contr. U. S. Nat. Herb. 16:258. 1913.

Phyllocactus pittieri Weber, in Bois, Dict. Hort. 2:957. 1898.

Succulent epiphytic shrubs, the primary stem joints terete or weakly angulate, 5–10 mm. thick when young, probably thicker when old, the secondary stem joints linear-elliptic, acute to obtuse at the tip, decurrent to a short terete subpetiolar base, about 2–10 dm. long and 2–6 cm. broad, rather narrowly serrate, thick and callose-marginate in dessication, the areoles 3–6 cm. distant, naked or indefinitely papillate, borne superficially upon the upper broad margin of the serrations. Flowers nocturnal, relatively small and inconspicuous, white, the perianth tube about 6–10 cm. long, narrowly tubular, about 4 mm. in diameter at the base, abruptly dilated into an extremely short conic throat about 7 mm. broad at the orifice, bearing few and distant inconspicuous petaloid bracts, the perianth segments linear-elliptic, acuminate, spreading, the inner about 4–5 cm. long, the ovary narrowly oblongoid, inconspicuously bracteate and tuberculate. Berry oblongoid, about 2 cm. long, deep red when ripe.

Costa Rica and Panama.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 1294*; Water Valley, *Von Wedel 1528, 1580, 1768A*; Quebrada Nigua, Almirante Bay, *Von Wedel 7*; Garay Creek, *Von Wedel 2630*. CANAL ZONE: Drayton Trail, Barro Colorado Island, *Shattuck 603*. CHIRIQUÍ: forest, Puerto Armuelles, *Davidson 1189*.

3. EPIPHYLLUM LEPIDOCARPUM (Weber) Britton & Rose, in Contr. U. S. Nat. Herb. 16:257. 1913.

Phyllocactus lepidocarpus Weber, in Bull. Mus. Hist. Nat. Paris 8:462. 1902.

Succulent epiphytic shrubs, the primary stem joints weakly 3-angled, up to 1 cm. thick when young, becoming terete and thicker when old, the secondary stem joints oblong- to narrowly ovate-elliptic, obtuse at the tip, decurrent to a very short weakly angled subpetiolar base, about 2–7 dm. long and 3–7 cm. broad, rather narrowly serrate, remarkably thin and more or less venose in dessication, the areoles 4–5 cm. distant, minutely puperulent, borne superficially upon the upper

broad margin of the serrations. Flowers nocturnal, rather broad and handsome, white with the outer segments flushed with rose, the perianth tube about 7–8 cm. long, tubular, about 4 mm. in diameter at the base, rather gradually dilating to a narrowly conical throat about 1.5 cm. broad at the orifice, bearing a few inconspicuous deciduous linear bracts subtending puberulent areoles toward the base, the segments 7–8 cm. long, the outer linear, flushed with rose, the inner narrowly obovate-elliptic, white, the ovary narrowly turbinate, bearing crowded persistent ovate bracts and conspicuous puberulent areoles. Berry turbinate-fusiform, occasionally conspicuously beaked, 6–9 cm. long, 2–4 cm. thick, covered with the accrescent hyaline bracts and puberulent areoles, purplish pink when ripe.

Highland Costa Rica and western Panama, epiphytic or upon rocks.

CHIRIQUÍ: valley of the upper Río Chiriquí Viejo, vicinity of Monte Lirio, alt. 1300–1900 m., *Seibert 206*; Bajo Chorro, Boquete District, alt. 6000 ft., *Davidson 253*.

A species particularly noteworthy because of its peculiar scaly fruits.

4. EPIPHYLLUM MACROPTERUM (Lem.) Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 4:193. 1923.

Phyllocactus macropterus Lem. Illustr. Hort. 11: Misc. 73. 1864.
Phyllocactus thomasianus K. Sch. in Monatsschr. Kakteenk. 5:6. 1895.
Phyllocactus costaricensis Weber, in Bull. Mus. Hist. Nat. Paris 8:463. 1902.
Phyllocactus macrocarpus Weber, loc. cit. 464. 1902.
Epiphyllum costaricense (Weber) Britton & Rose, in Contr. U. S. Nat. Herb. 16:256. 1913.
Epiphyllum thomasianum (K. Sch.) Britton & Rose, loc. cit. 259. 1913.

Massive succulent epiphytic shrubs, the primary stem joints terete or weakly 4-angled and 5–8 mm. thick when young, becoming stouter and terete in age, the secondary stem joints narrowly obovate- to oblong-elliptic, obtuse to rounded at the tip, broadly decurrent to a short weakly angled subpetiolar base, about 6–8 dm. long and 5–10 cm. broad, rather broadly and regularly crenate, rather thin and venose in dessication, conspicuously callose-marginate, the areoles 2–5 cm. distant, minutely puberulent, borne within the deep indentations of the crenations. Flowers nocturnal, very large and handsome, the perianth tube 12–15 cm. long, tubular, arcuate, about 6 mm. broad at the base, gradually dilating to a conical throat about 3 cm. broad at the orifice, pale greenish rose, bearing rather conspicuous persistent subfoliaceous bracts, the segments about 8–12 cm. long, slightly spreading, the outer linear-lanceolate, pale greenish rose, the inner obovate-elliptic, white; ovary oblongoid, about 3–4 cm. long, bearing many subfoliaceous bracts. Berry oblong-fusiform, usually beaked, about 10–12 cm. long and 4–5 cm. thick, slightly tuberculate at the minutely puberulent areoles, red when ripe.

Costa Rica and Panama, epiphytic and upon rocks, apparently usually at low altitudes.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 1164*; Snapper Point, *Von Wedel 2639*; Water Valley, *Von Wedel 736*; Shepherd Island, *Von Wedel 2722*. CHIRIQUÍ: Puerto Armuelles, *Davidson 1190*.

An extremely showy plant, but surpassed by the one which follows:

5. EPIPHYLLUM **gigas** Woodson & Cutak, spec. nov.

Frutices succulenti scandentes radicantes, ramis ut dicitur ultra pedes centum in longitudinem metientibus; articulis rami radicantibus validissimis ancipitibus leviter undulatis nostris 2–3 cm. crassis; articulis florigeris infeliciter ignotis. Flores maximi speciosissimi ut creditur albi noctiflori; perianthii tubo ca. 22–25 cm. longo basi ca. 7 mm. lato apicem versus gradatim dilatato ostio ca. 2.5–3.0 cm. diam. extus bracteas linearis paucas gerente; perianthii segmentis exterioribus linearibus longe acuminatis 15 cm. longis vel ultra patulis, interioribusne latioribus in exemplo nostro vix bene visis; ovario late cylindrico ca. 1.5 cm. longo inconspicue bracteato areolas parvas paucas minute puberulentes gerente. Bacca ignota. Species inter species generis jam cognitas omnibus partibus longe maxima.

PANAMÁ: Cerro Trinidad, alt. 800–1000 m., climbing rock faces of main peak, Oct. 20, 1946, *P. H. Allen 3772* (Herb. Missouri Bot. Gard., HOLOTYPE).

This is a tremendous species, far surpassing in size of all parts any other known *Epiphyllum*; as such it is impossible to ignore, even though one quite naturally would desire the flowering stem joints and fruits for a complete description. The rather regular undulations of the primary stem joints and the puberulent areoles of the ovary suggest an affinity with *E. macropterum* and *E. oxypetalum*. Mr. Allen's statement that the holotype specimen was a "giant liana, to several hundred feet in length" might seem totally incredible were it not for the gigantic flower which he preserved.

8. WITTIA K. Sch.

WITTIA K. Sch. in Monatsschr. Kakteenk. 13:117. 1903; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 3:206. 1923.

Pseudorhipsalis Britton & Rose, loc. cit. 4:213. 1923.

Succulent shrubby root-climbers, usually epiphytic; stems phylloid and jointed, usually of two intergrading types as in *Epiphyllum*: the primary terete or weakly winged, usually rooting, the secondary (flowering) flattened and leaf-like, lobed or undulate, with marginal areoles covered with few to several minute scales and indefinitely papillate or naked. Leaves lacking. Flowers ephemeral (or nocturnal?), sessile, borne singly at the areoles; perianth mediocre or relatively small, tubular to tubular-salverform or campanulate, the tube about as long as the segments or shorter, bearing a few inconspicuous deltoid bracts, the segments about 10–15, erect or spreading; stamens about 30–45, the filaments few to several times longer than the anthers, inserted at progressively deeper levels within the perianth tube, the outermost conspicuously shorter than the innermost; ovary ovoid-fusiform, minutely tuberculate-bracteate. Fruit a fleshy berry with rather few seeds.

It is extremely difficult to justify the separation of *Pseudorhipsalis* from *Wittia* upon the basis of our scanty herbarium material, and surely it is nearly impossible to do so even from the meagre descriptions and rather irrelevant comments of

Britton and Rose. Granted that there is an obvious transition between the subtribes Epiphyllanae and Rhipsalidanae, the purpose of illustration as well as that of convenience would be served better by fewer gradient genera than those recognized by Britton and Rose.

Britton and Rose enumerate two species each for *Wittia* and *Pseudorhipsalis*. In addition to the two species in Panama, *W. amazonica* is known from extreme northeastern Peru and adjacent Colombia, and *Ps. alata* from Jamaica.

a. Flowers tubular-salverform, white flushed with rose, the perianth segments widely spreading; flowering stem joints narrowly repand..... 1. W. HIMANTOCLADA
aa. Flowers tubular, deep pink tipped with lavender, the perianth segments erect; flowering stem joints narrowly serrate..... 2. W. PANAMENSIS

1. WITTIA **himantoclada** (Roland-Gosselin) Woodson, comb. nov.

Rhipsalis himantoclada Roland-Gosselin, in Bull. Soc. Bot. France 55:694. 1908.
Wittia costaricensis Britton & Rose, in Contr. U. S. Nat. Herb. 16:261. 1913.
Pseudorhipsalis himantoclada (Roland-Gosselin) Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 4:213. 1923.

Succulent epiphytic root-climbers, the primary stem joints terete or weakly winged, up to about 1.5 m. long, the secondary stem joints narrowly lanceolate or oblanceolate, 2–5 dm. long,1–5 cm. broad, obtuse to rounded at the tip, cuneately decurrent into a subpetiolar base, narrowly repand, thick and coriaceous in dessication, the areoles 1–2 cm. distant. Flowers tubular-salverform, white flushed with rose or orange without, the perianth tube about 5–6 mm. long, about 3 mm. in diameter at the base, the perianth segments 10–15, narrowly elliptic to linear, about 1 cm. long and up to 3 mm. broad, widely spreading; stamens about 45, slightly exserted to barely included; ovary broadly cylindrical, about 7 mm. long, deep rose. Berry unknown.

Costa Rica and Panama.

COCLÉ: north rim of El Valle, *Allen 1897*.

2. WITTIA PANAMENSIS Britton & Rose, in Contr. U. S. Nat. Herb. 16: 241. 1913; in Carnegie Inst. Wash. Publ. No. 248. 4:207. 1923.

Succulent scandent shrubs, epiphytic or upon rocks, the primary stem joints terete or weakly ancipitous, the secondary stem joints very narrowly oblong-lanceolate, rounded at the tip, cuneately decurrent into a very short subpetiolar base, 3–5 dm. long, 3–5 cm. broad, very narrowly and closely cuneate-serrate, thick and callose-marginate in dessication, the areoles 1.0–2.5 cm. distant, naked or indefinitely papillate beneath the minute imbricate scales, borne superficially upon the upper margin of the narrow serrations. Flowers ephemeral, rather small, tubular, pink tipped with lavender, the perianth tube about 1.5 cm. long, about 2 mm. in diameter at the base, scarcely dilated toward the orifice, the perianth segments about 10, about 1 cm. long, erect or essentially so; ovary about 3 mm. long, minutely tuberculate-bracteate. Berry not seen.

Eastern Panama; Colombia and Venezuela.

Fig. 27. *Wittia panamensis*

DARIÉN: Marragantí, *Williams 698*; trail between Pinogana and Yaviza, *Allen 278*. PANAMÁ: Chepo, *Pittier 4571*. SAN BLAS: Caledonia, *Elmore L40*.

Wittia panamensis is distinguished from *W. amazonica* by Britton and Rose solely upon the fruit, whether "smooth" or "roughened by small tubercles" respectively. I have seen no fruit of *W. panamensis* as yet, but the ovaries of the flowers certainly are minutely tuberculate and I rather suspect that the fruit of the two species may have much in common.

9. RHIPSALIS Gaertn.

RHIPSALIS Gaertn. Fruct. Sem. 1:137. 1788; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 4:219. 1923, nom. conserv.

Hariota Adans. Fam. 2:243. 1763, nom. rejic.

Rather slender succulent root-climbers, usually epiphytic; stems phylloid and jointed, terete or essentially so in our species, the areoles spiral, naked to abundantly hirsute or bristly. Leaves lacking. Flowers very small, sessile or somewhat sunken within the stem joints, solitary; perianth rotate, the segments free or essentially so, relatively few, sometimes only 5, usually spreading; stamens about twice as many as the perianth lobes, the filaments inserted on the margin of the hypanthium. Berry small, usually white, with rather few small seeds.

A perplexing genus of 50 or more species in tropical and subtropical America; also with several species described from the Old World, at least some of which may be introduced from America. Known as Mistletoe Cactus in the United States.

Besides the ubiquitous *Rh. cassytha* there are two very distinct species in Panama which are known only from sterile specimens. Both probably are undescribed, but of course cannot be provided with names until flowering plants are found.

Fig. 28. *Rhipsalis cassytha*

a. Sterile areoles minutely puberulent to essentially naked.
  b. Flowering areoles minutely puberulent to essentially naked..... 1. Rh. cassytha
  bb. Flowering areoles very conspicuously floccose-hirsute..... 2. Rh. sp.
aa. Sterile areoles with conspicuous tufts of spreading bristles..... 3. Rh. sp.

1. Rhipsalis cassytha Gaertn. Fruct. Sem. 1:137. 1788; Britton & Rose, in Carnegie Inst. Wash. Publ. No. 248. 4:225. 1923, as *cassutha*.

Cactus pendulus Sw. Prodr. 77. 1788.
Rhipsalis parasitica Haw. Syn. Pl. Succ. 187. 1812.
Hariota cassytha (Gaertn.) Lem. Cact. Gen. Nov. Sp. 75. 1839.

Pendulous, usually epiphytic succulents up to 9 m. long; stem joints terete, dichotomous or in false whorls, yellowish green, about 2–3 mm. thick when young, the areoles very inconspicuous, glabrous to minutely puberulent. Flowers lateral, solitary, greenish white, the perianth segments about 2 mm. long. Berry globose, white (rarely pink), about 5 mm. in diameter.

Throughout tropical America, apparently also in Ceylon and tropical Africa. Very frequent in Panama.

BOCAS DEL TORO: Water Valley, *Von Wedel 649, 1670*; Little Bocas, *Von Wedel 2529*; Pumpkin River, *Von Wedel 2584*; Isla Colón, *Von Wedel 2924*. CANAL ZONE: vicinity of Madden Dam and Alahuela, alt. 80–100 m., *Hunter & Allen 787*; Barro Colorado Island, *Shattuck 447*; Bas Obispo, *Verner s. n.*; Gatún Lake, *Rowlee & Rowlee 405*; Balboa, *Standley 28546*.

2. Rhipsalis sp.

This species has stem joints which are about half as thick as is usual for those of *Rh. cassytha*. The sterile areoles are glabrous or essentially so, but the young flowering areoles are covered with exceedingly dense tufts of yellow hairs 2–3 mm. long. If this is a species of series FLOCCOSAE, as seems probable, it is the most northern representative of it.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 1393*.

3. Rhipsalis sp.

This little plant resembles a Lycopodium at first glance. It is juvenile, apparently, and the stems, which are somewhat thicker than those of *Rh. cassytha*, have the sterile areoles beset with conspicuous tufts of spreading bristles 1–2 mm. long. Its general aspect agrees in general with the illustration of *Rh. aculeata* given by Britton & Rose (in Carnegie Inst. Wash. Publ. No. 248. 4: *pl. xxiv, fig. 8*). On the other hand, a good many *Rhipsalis* seedlings appear bristly or spiny and later more mature growth becomes almost glabrous.

BOCAS DEL TORO: Pumpkin River, *Von Wedel 2572*.

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. . Robert E. Woodson, Jr., Robert W. Schery and Collaborators 93–201

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FLORA OF PANAMA

BY

ROBERT E. WOODSON, JR.

AND

ROBERT W. SCHERY

AND COLLABORATORS

PART VII

Fascicle 2

THYMELAEACEAE
LYTHRACEAE (L. I. Nevling)
LECYTHIDACEAE
RHIZOPHORACEAE (D. P. Gregory)
COMBRETACEAE (A. W. Exell)
MYRTACEAE (G. J. H. Amshoff)

ANNALS
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Vol. XLV MAY, 1958 No. 2

FLORA OF PANAMA

Part VII. Fascicle 2*

THYMELAEACEAE

Shrubs and small trees, usually with soft wood and leathery flexible branches. Leaves alternate, spiral, exstipulate, pinnately veined. Inflorescence terminal or lateral, determinate, simple, or compound with the ultimate divisions umbelliform or capituliform. Flowers perigynous, perfect or (in our genera) unisexual and dioecious, regular or rarely somewhat zygomorphic; perianth dichlaymdeous or (in our genera) monochlamydeous through loss of the corolla, usually tetramerous, tubular to salverform or subrotate, more or less petalaceous, usually lepidote or puberulent without, the limb (calyx) 4- to 5-parted; stamens in 1 or 2 cycles, the outer antesepalous and inserted upon the perianth lobes, the inner antepetalous and inserted within the perianth tube; pistil usually 1-carpellate, superior, usually borne upon a short gynophore and subtended by an inconspicuous disc, containing a single pendulous ovule upon the ventral placenta, the stigma capitate, usually sessile or subsessile. Fruit a dry nutlet or small drupe (our genera); seed exalbuminous or essentially so, the embryo with thick convex cotyledons.

Thymelaeaceae are a rather small family chiefly abundant in South Africa and Australia and very poorly represented in the northern hemisphere, particularly in America. Although the small flowers include only vestigial petals at most, occasionally they are attractive because of petalaceous pigmentation of their hypanthium (perianth tube), aggregation into dense clusters, and sweet scent.

The wood of the branches is soft and the young twigs are remarkably leathery and flexible as a rule, hence the popular name Leatherwood for *Dirca palustris*, the unique representative of the family in the eastern United States. This quality of the stems is due in part to the anomalous development of the phloem which frequently forms an abundant interwoven fabric of soft fibers. In fact, Standley (Fl. Costa Rica 2:759. 1937) reports the vernacular name *mastate* for *Daphnopsis seibertii* in Costa Rica, which suggests the making of bark cloth.

a. Stamens 8, sessile or subsessile; pistillate flowers with staminodes..... 1. DAPHNOPSIS
aa. Stamens 4, widely exserted upon slender filaments winged at the base; pistillate flowers without staminodes..... 2. SCHOENOBIBLUS

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(93)

1. DAPHNOPSIS Mart. & Zucc.

DAPHNOPSIS Mart. & Zucc. Nov. Gen. & Sp. 1:65. 1824.

Hargasseria Schiede & Deppe, ex C. A. Meyer, in Bull. Acad. St. Petersbourg 1:356. 1843.
Nordmannia Fisch. & C. A. Meyer, loc. cit. 355. 1843.
Coleophora Miers, in Ann. & Mag. Nat. Hist. ser. 2. 8:197. 1851.

Shrubs or small trees. Leaves alternate, simple, exstipulate, membranaceous to coriaceous. Inflorescence terminal or axillary, cymose or paniculate, the ultimate branches usually umbelliform or capituliform. Flowers apetalous, dioecious, tetramerous; perianth salverform to campanulate, more or less petalaceous, usually densely puberulent, the limb deeply 4-lobed. Staminate flowers: stamens 8, sessile or subsessile, the outer cycle antesepalous, inserted at the base of the perianth lobes, barely exserted, the inner cycle antepetalous, inserted within the perianth tube; pistillode present, surrounded at the base by a delicate entire or lobed disc. Pistillate flowers usually smaller than the staminate: staminodes 8, 4, or absent; pistil 1-carpellate, containing a single pendulous anatropous ovule; stigma capitate, sessile or subsessile, usually slightly exserted; disc entire or lobed, hypogynous, usually delicately membranaceous. Fruit a small slightly fleshy drupe.

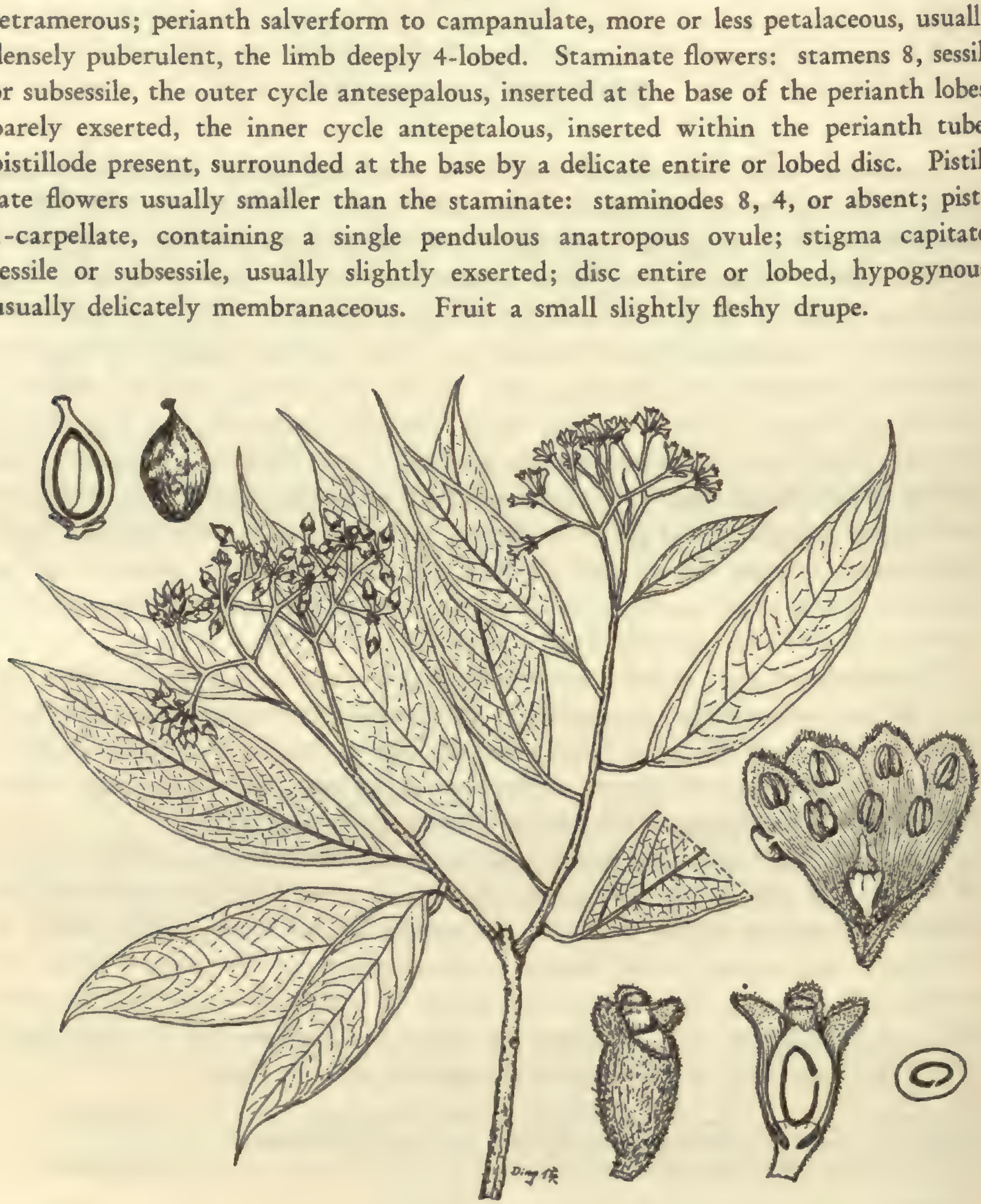

Fig. 29. *Daphnopsis seibertii*

About 25 species in southern Mexico, Central and South America, and the Antilles. A single species in Panama.

1. DAPHNOPSIS SEIBERTII Standl. in Ann. Missouri Bot. Gard. 24:192. 1937

Small dioecious trees 3–10 m. tall. Young stems minutely appressed-puberulent, soon glabrate, the bark pale grayish yellow, with small and crowded verrucose lenticels. Leaves alternate, petiolate, the blade elliptic to somewhat oblong- or oblanceolate-elliptic, acuminate to subcaudate-acuminate, rather narrowly attenuate at the base 6–15 cm. long, 2–5 cm. broad, subcoriaceous, glabrous above, essentially glabrous or minutely and indefinitely puberulent beneath; petiole 1.0–1.5 cm. long. Inflorescence terminal, the peduncle repeatedly dichotomous, densely and minutely appressed-puberulent, ebracteate, about as long as to somewhat shorter than the leaves, the flowers in capituliform clusters of several at the ends of the ultimate branches. Staminate flowers pale cream: perianth campanulate, densely appressed-puberulent without, the tube about 1.5 mm. long, about 2 mm. broad at the orifice, glabrous within, the lobes ovate-suborbicular, very slightly unequal, about 2 mm. long, widely spreading at anthesis; anthers about 0.5 mm. long, the outer inserted somewhat below the middle of the perianth lobes, the inner inserted just beneath the orifice of the perianth tube; pistillode about 0.75 mm. long, the stigma almost attaining the insertion of the inner stamens, the disc about half as long as the ovary, cupuliform, crenate; pedicel about 2.5 mm. long. Pistillate flowers pale cream; perianth narrowly urceolate, minutely appressed-puberulent without, the tube about 1.5 mm. long, about 1 mm. broad at the orifice, the lobes ovate-trigonal, strongly unequal, the outer about 1 mm. long, slightly spreading; pistil about 2 mm. long, the ovary ovoid, glabrous, the style short and stout, the stigma capitate, abundantly papillate; staminodia 8, about 0.5 mm. long; pedicel about 2 mm. long. Drupe ovoid, about 6 mm. long, with a very thin pulp, white, essentially sessile.

Nicaragua, Costa Rica and Panama, in highland woodland 60–1000 m. elev.

COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1281, 1764*; El Valle de Antón and vicinity, *Seibert 416, 444*. HERRERA: Pesé, *Allen 795*.

Daphnopsis seibertii is quite distinct from the other species of northern Central America and Mexico, and is most closely allied to *D. caribaea* Griseb. of Puerto Rico and the Lesser Antilles.

2. SCHOENOBIBLUS Mart. & Zucc.

SCHOENOBIBLUS Mart. & Zucc. Nov. Gen. & Sp. 1:65. 1824.

Shrubs or small trees. Leaves alternate, simple, exstipulate, membranaceous to coriaceous. Inflorescence terminal, paniculiform, the ultimate branches umbelliform. Flowers apetalous, dioecious, tetramerous; perianth rotate, more or less petalaceous, usually densely puberulent, the limb deeply 4-lobed. Staminate flowers: stamens 4, widely exserted upon elongate filaments, antesepalous, inserted at

Fig. 30. *Schoenobiblus panamensis*

the base of the perianth lobes; pistillode minute, stipitate, subtended by a minute, usually eccentric disc. Pistillate flowers (unknown from Panama): somewhat smaller than the staminate; staminodes not reported; pistil 1-carpellate, containing a single pendulous anatropous ovule; stigma capitate and obscurely 2-lobed, elevated upon a short stout style, exserted, subtended by an inconspicuous disc. Fruit a slightly fleshy drupe.

Perhaps half a dozen poorly defined species of northern South America, with one species each in Trinidad and Panama. The few specimens collected almost invariably have been staminate, and structural details of the pistillate flowers are known almost solely from the description of S. *ellipticus* Pilger in which, however, reference to staminodia is not made, intentionally or unintentionally. It is unfortunate that Pilger was not more explicit in this respect.

1. SCHOENOBIBLUS PANAMENSIS Standl. & L. O. Wms., in Ceiba 3:33. 1952.

Small dioecious trees 2–3 m. tall, the branches slender, essentially dichotomous, glabrous or glabrate, grayish brown. Leaves alternate, the blade subsessile, ob-

lanceolate, narrowly subcaudate-acuminate, narrowly cuneate at the base, 12–20 cm. long, 3.5–5.0 cm. broad, rather thinly membranaceous, prominently venose, glabrous. Staminate inflorescences terminal and in the upper leaf axils, paniculiform with few umbellate branches, the secondary peduncles 2.0–2.5 cm. long, minutely appressed-puberulent, bearing about 8–12 small pink and white flowers, the pedicels very slender, about 1.7 cm. long, minutely appressed-puberulent. Flowers densely appressed-puberulent without, rotate, the tube about 1 mm. long and broad at the orifice, pink, the lobes oblong-elliptic, spreading, white, about 4 mm. long and 1 mm. broad; stamens exserted, the filaments about 2 mm. long, the lower half concrescent to the base of the perianth lobes, the anthers about 1 mm. long; pistillode minutely fusiform, somewhat less than 1 mm. long, sparsely pilosulose, the disc flabelliform, eccentric, about half as long as the pistillode. Pistillate inflorescences and flowers, and fruit unknown.

Panama, in lowland forests.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 410*.

The natural affinities of this plant, the specimen of which is rather fragmentary, are quite obscure. It seems to be most closely related to S. *peruviana* of the upper Amazon of Peru which, however, has more copious inflorescences and flowers nearly twice the size of those of S. *panamensis*.

LYTHRACEAE

By LORIN I. NEVLING, Jr.

Herbs, shrubs, or trees. Leaves opposite, whorled or very rarely alternate, simple, entire, pinnately veined, sessile or petiolate; stipules small and caducous or absent. Flowers dichlamydeous, perfect, sometimes dimorphic or trimorphic, in 1- to several-flowered cymes gathered into lateral or terminal clusters, perigynous, actinomorphic or zygomorphic. Hypanthium free from the ovary, tubular, urceolate or campanulate, usually appendiculate between the calyx lobes. Petals inserted near the orifice of the hypanthium, usually of the same number as the calyx lobes or reduced, generally spatulate, crumpled in aestivation. Stamens usually twice the number of calyx lobes or less, rarely more, sometimes heteromorphic, occasionally alternately unequal, posterior stamen sometimes reduced to a hypogynous gland; anthers included or exserted, generally versatile, dehiscing longitudinally. Ovary superior, sessile or stipitate, sometimes heteromorphic, generally bicarpellate, the placentation axile to free-central; style simple, sometimes heteromorphic, elongate or short; stigma capitate or bilobed. Fruit a dehiscent or indehiscent capsule; seeds sometimes winged, without endosperm, the embryo straight.

A family of 22 genera and about 500 species. Cosmopolitan but most abundant in tropical America.

a. Leaves and flowers without prominent black punctate glands; herbs, shrubs or trees.
  b. Flowers relatively small, delicate, 3- to 6-merous; fruit a small membranaceous capsule; seeds wingless; herbs or shrubs.
    c. Flowers 3- to 5-merous, actinomorphic or rarely obscurely zygomorphic, axillary; hypanthium turbinate or campanulate, about as long as broad, not gibbous or spurred; stamens inserted at one level; herbs.
      d. Flowers usually solitary; leaves obtuse to attenuate at the base; capsule septicidally dehiscent..... 1. ROTALA
      dd. Flowers usually in clusters of 3, rarely 1 or 5; leaves auriculate at the base; capsule dehiscing irregularly..... 2. AMMANNIA
    cc. Flowers 6-merous, medianly zygomorphic, extra-axillary; hypanthium tubular, longer than broad, often gibbous or spurred at the base; stamens inserted at two levels; herbs or small shrubs..... 3. CUPHEA
  bb. Flowers massive, fleshy, 12- to 16-merous; fruit a large woody capsule; seeds winged; trees..... 4. LAFOENSIA
aa. Leaves and flowers with prominent black punctate glands; shrubs or small trees..... 5. ADENARIA

Members of two Asian genera have been introduced into Panama and are sometimes found as escapes. These genera are *Lawsonia* and *Lagerstroemia*. *Lawsonia inermis* L. is cultivated for ornament and because of the henna dye which is extracted from the leaves. *Lagerstroemia indica* L. and *Lagerstroemia speciosa* Pers., known as Crepe Myrtle, are widely cultivated as ornamentals because of their showy pink, purple or white flowers.

1. ROTALA L.

ROTALA L. Mant. 175. 1771.

Suffrenia Bellardi, in Act. Taurin. 7:445. 1794.
Boykinia Raf. Aut. Bot. 9. 1817, non Nutt.
Winterlia Spreng. Syst. 1:519, 788. 1825.
Ameletia DC. in Mém. Soc. Phys. Genève 3^2:82. 1826.
Nimmoia Wight, in Madr. Journ. Sci. 5:311. 1837.
Rhyacophila Hochst. in Flora 24:659. 1841.
Quartinia Endl. Gen. Suppl. 2:94. 1842.
Hydrolythrum Hook. Icon. Pl. n. s. 2: *t. 1007*. 1843.
Hypobrichia Benth. in Griseb. Cat. Pl. Cub. 108. 1886.

Aquatic or palustrine herbs, glabrous throughout, simple or sparsely branched. Leaves opposite or verticillate, sessile. Inflorescence of 1-flowered axillary cymes. Flowers usually 3- or 4-merous, bisexual, actinomorphic. Hypanthium appendiculate or exappendiculate, generally urceolate, membranaceous, the calyx lobes generally equal, valvate. Petals as many as the calyx lobes or absent. Stamens as many as the calyx lobes or fewer, equal, included, the anthers ovoid or oblong-ovoid, the filaments inserted about one-third from the base of the hypanthium. Ovary 3- or 4-carpellary, sessile or with a short gynophore, 1-locular, the placentation free-central; ovules many; stigma capitate. Fruit a horizontally striate septicidal capsule; style and hypanthium persistent; seeds minute.

About 38 species. America, Europe, Africa and Australia.

a. Plants palustrine; leaves and flowers decussate; hypanthium appendiculate, 2.5–5.0 mm. long; petals present..... 1. R. RAMOSIOR
aa. Plants aquatic or palustrine; at least the upper leaves and flowers ternate; hypanthium exappendiculate, 0.5–1.0 mm. long; petals absent..... 2. R. MEXICANA

Fig. 31. *Rotala mexicana*

1. ROTALA RAMOSIOR (L.) Koehne, in Mart Fl. Bras. 13^2:194, *t. 39, fig. 1.* 1877.

Ammannia ramosior L. Spec. Pl. ed. 1. 1:120. 1753.
Ammannia humilis Michx. Fl. Bor.-Amer. 1:99. 1803.
Boykinia humilis (Michx.) Raf. Aut. Bot. 9. 1817.
Ammannia ramosa J. Hill, in Veg. Syst. 11:14. 1824.
Peplis occidentalis Spreng. Syst. 2:135. 1825.
Ammannia catholica Cham. & Schlechtd. in Linnaea 2:378. 1827.
Ammannia occidentalis DC. Prod. 3:78. 1828.
Ammannia monoflora Blanco, Fl. Filip. ed. 1. 1:64. 1837.
Ammannia dentifera A. Gray, Pl. Wright. 2:55. 1853.
Rotala ramosior var. *interior* Fernald & Griscom, in Rhodora 37:169, *tab. 345, figs. 1 & 2.* 1935.
Rotala ramosior var. *dentifera* (A. Gray) Lundell, in Bull. Torr. Bot. Club 69:395. 1942.

Erect palustrine herbs to 3.5 dm. tall; branches somewhat angular at least toward the apex. Leaves elliptic or elliptic-oblanceolate, obtuse at the apex, cuneate to attenuate-cuneate at the base, 0.7–3.7 cm. long, 0.1–0.8 cm. wide. Flowers sessile, subtended by 2 linear bracts to 5 mm. long, 0.75 mm. wide. Hypanthium urceolate, 2.75–3.0 mm. long, 1.5–2.0 mm. broad at the orifice; calyx lobes broadly deltoid. Petals 0.7–1.25 mm. long, 0.6–0.75 mm. wide, white. Stamens as many as calyx lobes, minute, the anthers ovoid, about 0.3 mm. long, 0.3 mm. wide, the filaments to 1 mm. long. Ovary globose, 1.5–2.0 mm. long, sessile; style 0.2–0.5 mm. long. Seeds orbicular, about 0.25 mm. in diameter.

The United States, Central America, Antilles, Ecuador, Brazil, Philippine Islands.

CANAL ZONE: along the old Las Cruces Trail, between Fort Clayton and Corozal, *Standley 29053.* PANAMÁ: near Matías Hernández, *Standley 28936, 28987*; between Matías Hernández and Juan Díaz, *Standley 31996, 32013*; Juan Díaz, *Standley 30512, Killip 3273.*

2. ROTALA MEXICANA Cham. & Schlechtd. in Linnaea 5:567. 1830.

Rotala pusilla Tul. in Ann. Sci. Nat. 4 ser. 6:128. 1856.
Rotala apetala F. Muell. Fragm. 3:108. 1862.
Hypobrichia spruceana var. *tenuifolia* Griseb. Cat. Pl. Cub. 106. 1866.
Ammannia pygmea S. Kurz, in Seem. Journ. Bot. 5:376. 1867.
Rotala verticillaris Hiern, in Oliv. Fl. Trop. Afr. 2:467. 1871.
Rotala mexicana β *spruceana* Hiern, loc. cit. 1871.
Rotala mexicana subsp. *typica* var. α forma *minima* Koehne, in Mart. Fl. Bras. 13^2:195. 1877.
Rotala mexicana subsp. *typica* var. α forma *media* Koehne, loc. cit. 1877.
Rotala mexicana subsp. *typica* var. α forma *major* Koehne, loc. cit. 1877.
Rotala mexicana subsp. *typica* var. *spruceana* (Griseb.) Koehne, loc. cit. 1877.
Rotala mexicana subsp. *typica* Koehne, in Engl. Bot. Jahrb. 1:151. 1880.
Rotala mexicana subsp. *hierniana* Koehne, loc. cit. 1880.
Rotala mexicana subsp. *typica* var. *chamissoana* Koehne, in Engl. Pflanzenr. 4:30. 1903.
Rotala mexicana subsp. *pusilla* (Tul.) Koehne, loc. cit. 1903.

Creeping aquatic or palustrine herbs to 3 dm. tall, the branches obscurely angular. Leaves ternate, the submerged leaves linear, 3–18 mm. long, 0.5–3.0 mm. wide, the emersed leaves 3–8 mm. long, 1–2 mm. wide, both obtuse or retuse, cuneate-attenuate at the base. Flowers sessile, subtended by 2 setose bracteoles. Hypanthium urceolate, 0.6–1.0 mm. long, 0.5–0.6 mm. broad at the orifice; calyx

lobes narrowly deltoid, sometimes unequal. Petals absent. Stamens commonly 2, the anthers oblong-ovoid, about 0.1 mm. long, 0.25 mm. wide, the filaments about 0.4 mm. long. Ovary globose, abruptly narrowed into a short gynophore, 0.4 mm. long; style about 0.1 mm. long. Seeds suborbicular, about 0.3 mm. long, 0.25 mm. wide.

Central and South America, Asia, Africa and Australia. Found at low elevations in periodic streams and potholes.

CANAL ZONE: along the old Las Cruces Trail, between Fort Clayton and Corozal, *Standley 29222*; Darién Station, *Standley 31539*. CHIRIQUÍ: lower portion of valley and marshes along Río Antón, El Valle de Antón, about 500 m., *Hunter & Allen 366*. PANAMÁ: near Matías Hernández, *Standley 28989*; near the big swamp east of the Río Tecumen, *Standley 26715*; vicinity of Juan Franco Race Track, near Panamá, *Standley 27817*; along road between Panamá and Chepo, *Dodge, Hunter, Steyermark, & Allen 16721*; Las Sabanas, *Bro. Heriberto 151*; San José Island, Perlas Archipelago, East Harbor, *Johnston 830, Erlanson 459*.

Since this species is often found in periodic waters, two habits are found: an emersed and a submerged. *Rotala mexicana* flowers when the plants become emersed. Considerable difficulty is encountered in attempting to identify the submerged specimens. Identification, by means of vegetative characters only, is best accomplished by use of the obtuse or retuse leaf apex character.

2. AMMANNIA L.

AMMANNIA L. Sp. Pl. ed. 1. 1:119. 1753.

Cornelia Ard. Animadv. Specim. 2:9. 1764.
Cryptotheca Blume, in Bijdr. 1128, 1129. 1826.
Ditheca Miq. in Fl. Ind. Bat. 1:615. 1855.
Diplostemon Miq. loc. cit. 1855.
Hapalocarpum Miq. loc. cit. 1855.
Ammannella Miq. loc. cit. 618. 1855.

Annual herbs, simple or sparsely branched, the young branches obscurely tetragonal. Leaves opposite, sessile. Inflorescence of (1- to) several-flowered cymes gathered into axillary clusters; flowers (5-, 6- or) 4-merous, bisexual, actinomorphic. Hypanthium urceolate, appendiculate or exappendiculate, the calyx lobes valvate. Petals present or absent. Stamens of the same or twice the number of calyx lobes or less, inserted about a third from the base of the hypanthium. Ovary generally 4-carpellary, superior, sessile, the placentation generally axile; ovules many; style sometimes obsolete; stigma capitate. Fruit an irregularly dehiscent ovoid capsule, the hypanthium and style persistent; seeds many, minute.

About 20 species. America, Europe, Asia, Africa, Hawaiian and Mariana Islands. Only one indigenous and one introduced species in Panama.

a. Petals present; hypanthium appendiculate; stamens exserted..... 1. A. COCCINEA
aa. Petals absent; hypanthium exappendiculate; stamens included..... 2. A. LATIFOLIA

1. AMMANNIA COCCINEA Rottb. in Pl. Hort. Univ. Havn. Programm. 7. 1773.

Ammannia ramosior acc. to L. Mant. 2:332. 1771, not L. Spec. Pl. ed. 1.
Ammannia purpurea Lam. Encl. 1:131. 1783.

Ammannia sanguinolenta Swartz, Fl. Ind. Occ. 1:272. 1797.
Ammannia octandra acc. to Cham. & Schlechtd. in Linnaea 2:376. 1827, not L.
Ammannia stylosa Fisch. & Mey. in Ind. Sem. Hort. Petrop. 7:41. 1841.
Ammannia robusta Heer & Reg. in Ind. Sem. Hort. Turic. 1842, *adn. 1.*
Ammannia texana Scheele, in Linnaea 21:588. 1846.
Ammannia sanguinolenta subsp. *purpurea* Koehne, in Mart. Fl. Bras. 13^2:207, *t. 40, f. 4.* 1877.
Ammannia sanguinolenta subsp. *robusta* Koehne, loc. cit. 208, *t. 40, f. 4b.* 1877.
Ammannia sanguinolenta subsp. *longifolia* Koehne, loc. cit. 208. 1877.
Ammannia coccinea subsp. *robusta* (Heer & Reg.) Koehne in Engl. Bot. Jahrb. 1:250. 1880.
Ammannia coccinea subsp. *longifolia* Koehne, loc. cit. 1880.
Ammannia pubiflora Sosn. in Bull. Mus. Cauc., Tiflis, 8:165. 1915.

Erect slender herbs to 4 dm. tall, glabrous throughout, the stems angular. Leaves sessile, narrowly oblong, acute at the apex, auriculate-amplexicaul at the base, 1.5–6.5 cm. long, 0.2–1.3 cm. wide, the veins obscure. Inflorescence spiciform, leafy-bracted, the flowers in subsessile 1- to 3-flowered minutely bracteate cymes. Hypanthium urceolate, exappendiculate, becoming globose in fruit, 2.5–3.5 mm. long, about 2 mm. broad at the orifice, the calyx lobes generally unequal. Petals as many as calyx lobes, about 1.5 mm. long, 1.25 mm. wide, violet. Stamens exserted, the filaments glabrous, the anthers about 0.5 mm. long. Ovary ovoid, about 1.5–2.5 mm. long, 1.5 mm. in diameter, glabrous; style 1.5–2.5 mm. long.

The United States, Central and South America, Antilles; Hawaiian, Mariana, and Philippine Islands. Believed introduced into Panama in hay from Texas.

PANAMÁ: San José Island, Perlas Archipelago, *Johnston 1239.*

2. AMMANNIA LATIFOLIA L. Spec. Pl. ed. 1. 1:119. 1753.

Ammannia lythrifolia Salisb. Prodr. 65. 1796.
Isnardia subhastata Ruiz & Pav. Fl. Peruv. 1:66, *t. 86.* 1798.
Jussiaea sagittata Poir. in Lam. Encycl. Suppl. 3:198. 1818.
Ammannia ramosior Ell. Sketch 1:219. 1821.
Ammannia pallida Lehm. in Ind. Sem. Hort. Hamburg 3. 1823.
Ammannia sagittata DC. Prodr. 3:80. 1828.
Ammannia hastata DC. loc. cit. 78. 1828.
Ammannia humilis var. β Torr. & Gray, in Fl. N. Amer. 1:480. 1838–1840.
Ammannia catholica Hook. & Arn. Bot. Beechey's Voy. 289. 1841, acc. Seemann.
Ammannia lingulata Griseb. Cat. Pl. Cub. 106. 1866.
Ludwigia scabriuscula Kellogg, in Proc. Calif. Acad. 7:78. 1876.

Erect slender herbs to 4.5 dm. tall, glabrous throughout. Leaves sessile, narrowly oblong-lanceolate, acute at the apex, auriculate-amplexicaul at the base, 3.0–8.5 cm. long, 0.4–1.3 cm. wide, the primary lateral veins and submarginal vein obscure. Inflorescence spiciform, leafy-bracted, intercalary, the flowers in relatively distant, subsessile, 1- to 3-flowered minutely bracteolate cymes. Hypanthium urceolate, appendiculate, becoming globose in fruit, 2.4–4.0 mm. long, 1–2 mm. broad at the orifice, the calyx lobes broadly deltoid. Petals absent. Stamens included, the filaments glabrous, the anthers about 0.25 mm. long. Ovary ovoid, 1.5–3.5 mm. long, 1.0–2.5 mm. in diameter, glabrous; style about 0.5 mm. long.

Southern United States, Central and South America, Antilles.

PANAMÁ: Bella Vista, at sea level, *Killip 12031.*

Fig. 32. *Ammannia latifolia*

3. CUPHEA P. Br.

CUPHEA P. Br. Nat. Hist. Jam. 216. 1756.

Melanium P. Br. loc. cit. 215. 1756.
Parsonsia P. Br. loc. cit. 199. 1756.
Balsamona Vell. in Vandelli, Fasc. *pl. 15*. 1771.
Silene Leavenw. in Sillim. Journ. 7:62. 1799.
Melvilla Anders. in Journ. Arts & Sci. 25:207. 1807.
Bergenia Raf. Sylv. Tellur. 102. 1838.
Endecaria Raf. loc. cit. 1838.
Quirina Raf. loc. cit. 1838.
Dipetalon Raf. loc. cit. 1838.
Melfona Raf. loc. cit. 1838.
Maja Klotzsch, in Schomb. Fl. Fauna Guian. 1191. 1848.

Annual or perennial herbs or shrubs, generally branched, sometimes rhizomatous. Leaves opposite or approximate, sessile or petiolate; the stipules setose. Inflorescence of 1- to several-flowered interpetiolar cymes gathered into terminal bracteate or leafy paniculiform or racemiform clusters. Flowers 6-merous, bisexual, medianly zygomorphic. Hypanthium tubular, appendiculate, more or less gibbous, sometimes spurred, ribbed, occasionally colored, the calyx lobes equal or rarely unequal, valvate. Petals spatulate, 6 or rarely reduced to the posterior 2, inserted at the orifice of the hypanthium, red to violet. Stamens 11, the 2 posterior inserted lower in the hypanthium than the 9 anterior, included, the 9 anterior equal or when unequal the antesepalous stamens longer than the antepetalous, included or exserted, the posterior antesepalous stamen modified into a basal hypogynous, unilateral, ovate to ovate-reniform or more rarely strongly involute-cupuliform disc, the anthers oblong, the filaments glabrous or pubescent. Ovary bicarpellary, superior, sessile, bilocular toward the base, unilocular above, the placentation incompletely axile; ovules few to many; style slender; stigma capitate. Fruit a unilaterally loculicidal capsule enclosed within the persistent hypanthium which also is ruptured by the reflexed protuberant placenta. Seeds lenticular, sometimes marginate.

A very perplexing genus. The United States, Central and South America, Galapagos and Hawaiian Islands.

a. Hypanthium at anthesis 4–10 mm. long.
  b. Flowers ebracteolate; disc cupuliform; seeds more than 20..... 1. C. UTRICULOSA
bb. Flowers bracteolate; disc unilateral; seeds less than 10.
  c. Cymes gathered into terminal bracteate racemiform or paniculiform clusters; disc reflexed.
    d. Style and stamens included..... 2. C. SETOSA
    dd. Style and at least the antesepalous stamens greatly exserted..... 3. C. EPILOBIFOLIA
  cc. Cymes gathered into terminal foliate racemiform or paniculiform clusters; disc erect to horizontal.
    e. Hypanthium not spurred, merely gibbous; seeds emarginate; plants often rhizomatous..... 4. C. CALOPHYLLA
    ee. Hypanthium spurred; seeds marginate; plants seldom rhizomatous. ..... 5. C. CARTHAGENENSIS
aa. Hypanthium at anthesis 22–35 mm. long..... 6. C. INFUNDIBULUM

Cuphea rotundifolia Koehne, resembling *C. calophylla* but with more rotundate leaves, has been reported from Panama but I have not seen specimens of this species from that area.

1. CUPHEA UTRICULOSA Koehne, in Mart. Fl. Bras. 13^2:452. 1877.

Cuphea gracilis acc. to Seemann, Bot. Voy. Herald, 121. 1852–57, not Benth.
Cuphea panamensis Hemsl. Diagn. Pl. Nov. Mex. 3:52. 1880.
Cuphea utriculosa var. *panamensis* (Hemsl.) Koehne, in Engl. Bot. Jahrb. 1:452. 1881.
Cuphea utriculosa var. *donnell-smithii* Koehne, in Bot. Gaz. 18:203. 1893.
Cuphea utriculosa var. α forma *communis* Koehne, in Engl. Pflanzenr. 4:108. 1903.
Cuphea utriculosa var. α forma *ciliifolia* Koehne, loc. cit. 1903.
Parsonsia utriculosa Standl. in Contrib. U. S. Natl. Herb. 23:1017. 1924.

Erect slender herbs to 4 dm. tall, sometimes subligneous near the base; branches with minutely tomentose lines decurrent from the paired nodes above. Leaves oblong-elliptic, acute at the apex, cuneate-attenuate at the base, 0.4–6.0 cm. long, 0.2–1.1 cm. wide, sessile or subsessile, both surfaces glabrous, the primary lateral veins inconspicuous, the margin minutely ciliate. Flowers decussate, solitary; pedicels 4–13 mm. long, bracteoles absent. Hypanthium subampullaceous, 5.5–8.0 mm. long, median diameter 1.5–2.5 mm., transverse at the orifice, gibbous at the base, minutely puberulent, the posterior calyx lobe enlarged. Petals 6, the 2 posterior 2.5–4.5 mm. long, 1.5–2.0 mm. wide, the 2 anterior 3.0–5.5 mm. long, 1.5–2.5 mm. wide; violet. Stamens 11, the anterior 9 equal, included, the lower half of the filaments pubescent; disc cupuliform, split anteriorly. Ovary broadly ovoid, 2.5–3.25 mm. long, villous; style 1–2 mm. long, villous, included. Seeds 24–36, suborbicular, around 1 mm. long, 0.75 mm. wide, emarginate.

Southern Mexico to Panama in moist habitats.

CANAL ZONE: near Fort Randolph, *Standley 29848*; drowned forest of Quebrada Bonita, 70–80 m., *Dodge & Allen s. n.*; drowned forest of Quebrada Culebra, 70–75 m., *Dodge & Allen 17049*; Chivi-Chivi River, near Aguarubia, *Killip 3366*; forest between Peluca Hydrographic Station and Quebrada Peluca, along Río Boquerón, 70– m., *Steyermark & Allen 17233*; drowned forest of Quebrada Ancha, 70 m., *Steyermark & Allen s. n.*; Río Paraíso above East Paraíso, *Standley 29877*. COCLÉ: vicinity of Ola, alt. 100–350 m., *Pittier 5032*; Bismarck, 2000–3000 ft. elev., above Penonomé, *Williams 264*. PANAMÁ: Río La Maestra, 0–25 m., *Allen 30*.

2. CUPHEA SETOSA Koehne, in Mart. Fl. Bras. 13^2:223. 1877.

Cuphea rigidula acc. to Seemann, Bot. Voy. Herald, 121. 1852–57, not Benth.
Cuphea setosa var. α forma *seemannii* Koehne, in Engl. Bot. Jahrb. 1:456. 1881.
Cuphea setosa var. *glabrescens* Koehne, loc. cit. 1881.

Erect herbs to 3.8 dm. tall, subligneous at least near the base, the branches with brown hispid recurved hairs in lines decurrent from the paired nodes above, area between lines grayish-strigose. Leaves elliptic to ovate-elliptic, acute at the apex, attenuate at the base, 3–9 cm. long, 1–3 cm. wide, both surfaces strigose with interspersed setose hairs, the primary lateral veins arcuate, almost forming a submarginal vein, the margin ciliate; stipules setose. Cymes gathered into terminal, bracteate, racemiform, rarely paniculiform, clusters. Flowers decussate, solitary, infra-interbracteal; bracts elliptic, to 2.5 mm. long, 1 mm. wide, coarsely ciliate,

Fig. 33. *Cuphea utriculosa*

caducous; peduncle 0.5–1.0 mm. long; pedicel 1.25–2.0 mm. long; bracteoles 2, minute, sometimes caducous. Hypanthium ampullaceous, 5.0–6.5 mm. long, median diameter about 1.5 mm., oblique at orifice, spur straight, hispid without, tomentose within, sometimes insect-infested and becoming swollen and bladdery. Petals 6, 1.5–2.0 mm. long, 0.75–1.0 mm. wide, violet. Stamens 11, the anterior 9 alternately unequal, included, the anthers oblong, to 0.5 mm. long, the filaments tomentose with the exception of the 3 anterior antesepalous; disc unilateral, strongly reflexed. Ovary narrowly ovoid, 1.0–1.25 mm. long, 0.5–0.75 mm. in diameter, tomentose; style 1.5–2.5 mm. long, tomentose, included. Seeds 4, almost cordiform, 1.5 mm. long, 1.5 mm. wide, emarginate.

Central America, Colombia, Peru, Bolivia.

CANAL ZONE: forest between Peluca Hydrographic Station and Quebrada Peluca, along Río Boquerón, 70– m., *Steyermark & Allen 17258.*

3. CUPHEA EPILOBIFOLIA Koehne, in Mart. Fl. Bras. 13^2:223. 1877.

Cuphea epilobifolia var. *costaricensis* Koehne, in Engl. Bot. Jahrb. 1:457. 1881.
Cuphea epilobifolia var. *costaricensis* forma *canescens* Koehne, in Bot. Gaz. 20:4. 1895.
Cuphea epilobifolia var. *costaricensis* forma *tonduzii* Koehne, in Engl. Bot. Jahrb. 39:156. 1900.
Cuphea epilobifolia var. *venezuelana* Koehne, in Engl. Pflanzenr. 4:112. 1903.
Cuphea epilobifolia var. *venezuelana* forma *gollmeri* Koehne, loc. cit. 1903.
Cuphea epilobifolia var. *venezuelana* forma *lindenii* Koehne, loc. cit. 1903.
Cuphea epilobifolia var. *costaricensis* forma *hoffmannii* Koehne, in Engl. Pflanzenr. 4:112. 1903.
Cuphea epilobifolia var. *costaricensis* forma *endresii* Koehne, loc. cit. 113. 1903.
Cuphea epilobifolia var. *caquetae* Sprague, in Ann. Bot. 17:161, *t. 11, f. 1–6.* 1903.
Parsonsia epilobifolia Standl. in Contrib. U. S. Natl. Herb. 23:1018. 1924.

Woody shrubs to 2 m. tall, apical portions of branches densely wooly or at least with tomentose lines decurrent from the paired nodes above. Leaves elliptic, sessile or subsessile, acute at the apex, attenuate at the base, 3–14 cm. long, 0.8–3.0 cm. wide, both surfaces puberulent to strigose, the costa glabrous to brown-strigose beneath, the submarginal vein sometimes conspicuous, sometimes bearing brown strigose hairs, the margin entire; stipules somewhat persistent. Cymes gathered into terminal bracteate racemiform or paniculiform clusters; flowers decussate, infra-interbracteal; bracts lanceolate, to 4 mm. long, 1.5 mm. wide, puberulent, coarsely ciliate, caducous; peduncle 0.75–1.0 mm. long; pedicel 1–5 mm. long; bracteoles 2, minute. Hypanthium ampullaceous, 4.0–7.5 mm. long, median diameter 0.75–1.5 mm., oblique at the orifice, the spur straight to recurved, densely strigose or hirsute, sometimes insect-infested and becoming swollen and bladdery. Petals 6, 1.25–2.0 mm. long, 0.25–1.25 mm. wide, pink to violet. Stamens 11, the anterior 9 alternately unequal, antesepalous exserted, antepetalous included to slightly exserted, the filaments villous except for the 3 anterior antesepalous, or all glabrous; disc unilateral, strongly reflexed. Ovary broadly ovoid, 1.5–2.5 mm. long, villous; style 2.75–5.5 mm. long, villous, exserted. Seeds 4–6, suborbicular to orbicular, 1.0–1.5 mm. long, 1.0–1.5 mm. wide, emarginate to slightly marginate.

Costa Rica, Panama, Venezuela.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 215a*; *Carleton 215*; Fish Creek Hills, vicinity of Chiriquí Lagoon, *Von Wedel 2194, 2458*; Sibubi Falls, Sixaola Valley, *Rowlee & Rowlee 379*. COCLÉ: vicinity of El Valle, 800–1000 m., north rim, *Allen 215*; north rim of El Valle de Antón, near Cerro Turega, alt. 650–700 m., *Woodson & Schery 161*; El Valle de Antón, floor, vicinity Finca Tomás Árias, alt. 600 m., *Allen 3624*; El Valle de Antón, along Río Indio trail, 500–700 m., *Hunter & Allen 359*. CANAL ZONE: forest between Peluca Hydrographic Station and Quebrada Peluca, along Río Boquerón, 70– m., *Steyermark & Allen 17236*.

4. CUPHEA CALOPHYLLA Cham. & Schlechtd. in Linnaea 2:361. 1827.

Cuphea plumbaginea Mart. in Flora Beibl. 21[2]:62. 1838.
Cuphea antisyphilitica acc. to Seemann, Bot. Voy. Herald, 121. 1852–57, not HBK.
Cuphea orthodisca Koehne, in Mart. Fl. Bras. 13[2]:224. 1877.
Cuphea microstyla Koehne, loc. cit. 1877.
Cuphea calophylla var. *calophylla* Koehne, in Engl. Bot. Jahrb. 2:138. 1881.
Cuphea calophylla var. *calophylla* forma *deformis* Koehne, loc. cit. 1881.
Cuphea calophylla var. *orthodisca* Koehne, loc. cit. 1881.
Cuphea calophylla var. *microstyla* Koehne, loc. cit. 139. 1881.
Cuphea calophylla var. *calophylla* forma *breuningii* Koehne, in Engl. Bot. Jahrb. 29:156. 1900.
Cuphea calophylla var. *calophylla* forma *plumbaginea* (Mart.) Koehne, in Engl. Pflanzenr. 4:116. 1903.
Parsonsia calophylla Standl. in Contrib. U. S. Natl. Herb. 23:1018. 1924.

Erect or sprawling herbs to 5.5 dm. tall, rhizomatous, the branches wooly interspersed with occasional large red hairs, scabrous. Leaves lanceolate to elliptic-lanceolate, acute at the apex, obtuse at the base, 0.8–4.0 cm. long, 0.1–2.0 cm. wide, reduced toward the apex, above glabrous to puberulous and strigose, beneath strigose and scabrous, margin minutely ciliate, primary lateral veins slightly arcuate; petiole 1–5 mm. long. Cymes gathered into terminal foliate racemiform or paniculiform clusters, the flowers alternately interpetiolar, solitary; peduncle 3.5–7.0 mm. long; pedicel about 0.25 mm. long; bracteoles 2, minute. Hypanthium subampullaceous, 4–7 mm. long, median diameter about 1.25 mm., transverse at the orifice, gibbous at the base, white puberulent with interspersed red hairs. Petals 6, 2.5–3.0 mm. long, 1.5–2.0 mm. wide, violet. Stamens 11, the anterior 9 alternately unequal, included, the filaments densely villous; disc unilateral, not reflexed. Ovary broadly ovoid, 1.5–3.0 mm. long, greatly elongating in fruit, glabrous; style 1.0–1.5 mm. long, glabrous or villous, included, becoming exserted in fruit. Seeds 5–9, suborbicular, 1.0–1.8 mm. long, 1.0–1.5 mm. wide, emarginate.

Central America, Brazil.

CANAL ZONE: Chagres, *Fendler 111, 223*; between Chagres Batteries and Fort San Lorenzo, Fort Sherman Military Reservation, *Maxon & Valentine 7025*; rocky banks of Chagres at El Vigía, *Pittier 2376, 2377*; drowned forest of Quebrada below Río Indio Hydrographic Station, 70 m., *Steyermark 17396*; forest between Peluca Hydrographic Station and Quebrada Peluca, along Río Boquerón, 70– m., *Steyermark & Allen 17231*; around Gamboa, alt. 20–100 m., *Pittier 4794*; along the old Las Cruces Trail, between Fort Clayton and Corozal, *Standley 29085*; vicinity of Monkey Hill, *Cowell 30*; Cocoli, *Riley 129*; Balboa, *Standley 29257, 25455*; Ancón Hill, *Standley 25193, Killip 3040, Johansen 26*; Cerro Ancón, *Bro. Heriberto 127*; Mount Hope Cemetery, *Standley 28764*; Juan Minas, *Piper 5704*. COCLÉ: Penonomé and vicinity, 50–1000 ft. elev., *Williams 150*. COLÓN: between France Field and Cativa1, *Standley 30417*. DARIÉN: headwaters Río Chico, 500–750 ft., *Allen 4611*. PANAMÁ: forests of the upper Mamoní River, alt. 150–400 m., *Pittier 4481*; Orange River Valley, vicinity of Juan Díaz, *Killip 3330*.

5. CUPHEA CARTHAGENENSIS (Jacq.) Macbr. in Field Mus. Publ. Bot. 8:124. 1930.

Lythrum carthagenensis Jacq. Stirp. Amer. Hist. 148. 1763.
Balsamona pinto Vand. Fasc. *pl. 15*. 1771.
Cuphea balsamona Cham. & Schlechtd. in Linnaea 2:363. 1827.
Cuphea elliptica var. *a* Koehne, in Engl. Bot. Jahrb. 2:145. 1881.
Parsonsia pinto Heller, in Minn. Bot. Stud. 9:862. 1897.

Erect herbs to 4.5 dm. tall, sometimes subligneous near the base, simple to alternately branched, the branches generally glandular-hirsute with interspersed white tomentose hairs becoming hispid toward the apex. Leaves lanceolate to ovate or elliptic, acute at the apex, cuneate or attenuate at the base, 1.0–5.5 cm. long, 0.4–2.1 cm. wide, both surfaces strigose and scabrous, upper surface sometimes also puberulent, the margin ciliate, the primary lateral veins arcuate; petiole 0.1–0.3 mm. long; stipules minute. Cymes gathered into terminal foliate racemiform or paniculiform clusters, the leaves subtending the flowers gradually reduced above, setose-ciliate, both surfaces strigose and scabrous. Flowers interpetiolar, generally solitary; peduncle 0.5–1.2 mm. long; pedicel 0.25–0.75 mm. long; bracteoles 2, minute. Hypanthium subampullaceous or ampullaceous, 2.5–7.0 mm. long, the median diameter around 1.25 mm., transverse at the orifice, spur straight, with glandular hirsute pubescence generally restricted to the ribs, sometimes shortly villous toward the base. Petals 6, 1.25–2.0 mm. long, about 0.5 mm. wide, violet to purple. Stamens 11, the anterior 9 alternately unequal, included, the filaments glabrous or villous; disc not reflexed. Ovary broadly ovoid, 2–3 mm. long, glabrous; style 0.5–1.0 mm. long, included, glabrous. Seeds 3–7, orbicular to elliptic, 1.0–2.5 mm. long, 0.75–2.0 mm. wide, marginate.

The United States, Central and South America; Antilles; Hawaii. The presence of this species in Hawaii is probably the result of introduction.

BOCAS DEL TORO: Isla Colón, alt. 0–120 m., southwest of Bocas at Macaw Hills, *Von Wedel 525*; Macaw Hill, swampland, *Von Wedel 4*; vicinity of Chiriquí Lagoon, *Von Wedel 2494*. CANAL ZONE: Gatún, *Piper 5996*; near Gatún, *Standley 27316*; Barro Colorado Island, *Bailey & Bailey 500, Aviles 60, Starry 272, Kenoyer 464, Duchassaing s. n.*; between Las Cascadas and Bas Obispo, along the railroad, altitude 50 m., *Pittier 3747*; Old Panamá, *Riley 150, 151*. CHIRIQUÍ: Boquete, el. 3800 ft., *Davidson 577, 673*; vicinity of Boquete, alt. 1200–1500 m., *Woodson & Schery 767, 803*; vicinity of Cerro Punta, 1500–2000 m., *Seibert 252*; llanos del Volcán, 1120–1200 m., *Seibert 350*. COLÓN: between France Field, Canal Zone and Cativa1, *Standley 30415*. PANAMÁ: Bella Vista, at sea level, *Killip 12035*; wet savanna east of Pacora, ca. 25 m., *Woodson, Allen & Seibert 728*; thickets and forests near Arraiján, ca. 15 m., *Woodson, Allen & Seibert 1369*; Chepo, alt. about 60 m., *Pittier 4463, 4463a*; Laguna de Portala, near Chepo; alt. 50 m., *Pittier 4620*; Río Tecumen, *Standley 29456*; Sabanas, *Bro. Paul 51*; Isla Taboga, ca. 0–186 m., *Woodson, Allen & Seibert 1433*; San José Island, Perlas Archipelago, *Johnston 988, Erlanson 499*.

Examination of the type material of *Cuphea elliptica* reveals much disparity between the specimens and the original description, but it does fall well within the range of measurements of *C. carthagenensis*. I have been unable to find any character or combination of characters to distinguish *C. elliptica* var. *a* from *C. carthagenensis*. The characters formerly employed can be shown to be unreliable. I feel certain that only one species is represented.

6. CUPHEA INFUNDIBULUM Koehne, in Mart. Fl. Bras. 13^2:236. 1877.

Cuphea appendiculata acc. to Seemann, in Bot. Voy. Herald, 121. 1852–57, not Benth.
Cuphea infundibulum var. *foliosa* Koehne, in Engl. Bot. Jahrb. 7:43. 1885.

Erect slender herbs to 2.5 m. tall, subligneous at least near the base, branches white-puberulent interspersed with yellow hispid hairs at least near the apex. Leaves broadly elliptic, acuminate, obtuse and abruptly decurrent at the base, 3–13 cm. long, 1.5–4.5 cm. wide, above puberulent and scabrous, beneath strigose, with a well-developed submarginal vein, margin minutely ciliate; petiole to 5 (–12) mm. long. Flowers in young plants solitary, interpetiolar, transitional in fully mature plants to cymes gathered into terminal bracteate paniculiform clusters; bracts elliptic, 2.5–5.0 mm. long, 1.0–2.5 mm. wide, both surfaces sericeous, caducous. Peduncle 1–4 mm. long; pedicel 0.75–1.5 mm. long; bracteoles 2, minute. Hypanthium infundibuliform, 23–35 mm. long, median diameter 2.6–3.0 mm., transverse at the orifice, at most slightly gibbous at the base, the lower third yellowish-green, puberulent and hirsute, the upper two-thirds salmon-red, puberulent. Petals 2, posterior, 2.5–3.25 mm. long, 1.0–1.75 mm. wide, red. Stamens 11, the anterior 9 alternately unequal, exserted, the filaments glabrous; disc unilateral, semi-cupuliform at the base, not reflexed. Ovary very narrowly ovoid, 3–8 mm. long, glabrous; style 2.3–3.0 mm. long, glabrous, exserted. Seeds 5–7, suborbicular, about 2.5 mm. long, 2 mm. wide, emarginate.

Costa Rica, Panama.

CHIRIQUÍ: llanos on slopes of Volcán de Chiriquí and along Río Chiriquí Viejo, 1200 m., *Allen 998*; trail from Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, alt. 1500–2000 m., *Allen 1510*; rocky plains about 5 miles south of Boquete, alt. 3000 ft., *Allen 4710*; Bajo Mono, Boquete District, el. 4500 ft., *Davidson 489*; El Boquete, alt. 1450 m., *Killip 3552*; vicinity of El Boquete, alt. 900–1200 m., *Bro. Maurice 689*; forests along Río Ladrillo and vicinity, above El Boquete, alt. 1200–1300 m., *Maxon 5392*; pastures around El Boquete, alt. 1000–1300 m., *Pittier 2883*; between Cerro Vaca and Hato del Loro, eastern Chiriquí, alt. 850–1100 m., *Pittier 5383*; valley of the upper Río Chiriquí Viejo, vicinity of Monte Lirio, 1300–1900 m., *Seibert 304*; valley of the upper Río Gariché, 1050–1100 m., *Seibert 333*; vicinity of Casita Alta, Volcán de Chiriquí, ca. 1500–2000 m., *Woodson, Allen & Seibert 862*; Finca Lérida to Boquete, ca. 1300–1700 m., *Woodson, Allen & Seibert 1133*.

4. LAFOENSIA Vand.

LAFOENSIA Vand. Fl. Lusit. & Bras. Specim. 33. 1788.

Calyplectus Ruiz & Pav. Peruv. & Chil. Prodr. 73. 1794.

Small trees, the young branches more or less tetragonal, becoming terete with age. Leaves opposite, petiolate, glandular, stipulate. Inflorescence of 1-flowered cymes gathered into terminal leafy racemiform or rarely paniculiform clusters. Flowers usually 12- to 16-merous, bisexual, actinomorphic. Hypanthium generally campanulate with alternate coriaceous teeth between the equal, conduplicate-valvate calyx lobes, the appendages absent. Petals inserted slightly below the orifice of the hypanthium, as many as the calyx lobes, spatulate, white to yellow. Stamens generally twice the number of calyx lobes, exserted, the anthers oblong-linear, the

Fig. 34. *Lafoensia punicifolia*

filaments united at the base into a fleshy perigynous cup continuous with the hypanthium. Ovary with a gynophore, bicarpellate, unilocular, the placentation free-central; ovules many; stigma capitate. Fruit an indehiscent capsule; seeds winged.

About 10 species. Mexico to Brazil. Only 1 species indigenous to Panama.

1. LAFOENSIA PUNICIFOLIA DC. in Mém. Soc. Phys. Genève 3^2:86, *t. 1.* 1828 (as *punicaefolia*).

Small trees to 15 m. tall, glabrous throughout. Leaves elliptic to obovate, obtusely subcaudate-acuminate at the apex, obtuse to rounded at the base, 5–9 cm. long, 1.0–3.5 cm. wide, the gland at distal end of the costa opening on the lower surface by means of a small pore, the submarginal vein well developed; petiole 5–6 mm. long. Peduncle 19–27 mm. long; pedicel 2.5–5.0 mm. long; bracteoles 2, 5–7 mm. long, 8–12 mm. wide, coriaceous, caducous. Hypanthium campanulate, 2.5–4.0 cm. long, 2.5–3.5 cm. broad at the orifice, coriaceous except the more or less deltoid calyx lobes. Petals inserted about 5 mm. below the orifice of the hypanthium, 2.7–3.0 cm. long, 0.8–1.5 cm. wide, sometimes erose. Stamens equal, greatly exserted, the anthers 7–8 mm. long, the filaments 7–9 cm. long, inserted at one level about one-third above the base of the hypanthium, contorted in bud, red. Ovary turbinate, 5–10 mm. long, about 5 mm. in diameter, somewhat abruptly narrowed into a cuneate gynophore 5–11 mm. long, glabrous; style to 10 cm. long, exserted. Fruit a hard thick-walled capsule to 6.5 cm. long, 4 cm. in diameter. Seeds oblong-lanceolate, to 40 mm. long, 5–15 mm. wide; cotyledons ovate.

Mexico, Guatemala, Panama, Venezuela, Colombia, Bolivia. A yellow dye is extractable from the leaves of this species. The wood is used in cabinet work. Known as *amarillo* in Panama.

CANAL ZONE: Barro Colorado Island, *Aviles 28b, Shattuck 437, Zetek 3616*; Barro Colorado Island, shore of cove S. of Fr. Lock site, *Woodworth & Vestal 475*. DARIÉN: Real de Sta. Marta, South Darién, *Pittier 6985*; forests around Pinogana, southern Darién, *Pittier 6985a*. PANAMÁ: along road between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen 16705*; between Las Sabanas and Matías Hernández, *Standley 31907*; Sabanas near Chepo, 30 m., *Hunter & Allen 24*; near Chepo, *Kluge 18*; Chepo, alt. about 60 m., *Pittier 4763*; near the big swamp east of the Río Tecumen, *Standley 26558, 26705*; Río Tecumen, *Standley 29437*; vicinity of Pacora, alt. ca. 35 m., *Allen 1006*.

5. ADENARIA HBK.

ADENARIA HBK. Nov. Gen. & Spec. 6:185, *t. 549*. 1823.

Shrubs or small trees, black punctate-glandular generally, the young branches tetragonal, becoming terete with age. Leaves opposite, petiolate; stipules setose. Cymes gathered into axillary umbelliform clusters. Flowers 4- or 5-merous, bisexual, heterostylic, actinomorphic. Hypanthium campanulate, not ribbed, the calyx lobes more or less equal, valvate; exappendiculate. Petals inserted at the orifice of the hypanthium, as many as calyx lobes, rose or white. Stamens usually

Fig. 35. ***Adenaria floribunda***

twice the number of calyx lobes, included or exserted, the filaments united at the base to form a somewhat fleshy perigynous ring at the base of the hypanthium. Ovary bicarpellary with a gynophore, bilocular, the placentation axile; ovules many; stigma bilobed. Fruit an indehiscent ovoid capsule, the style and hypanthium persistent; seeds small.

Mexico to Argentina. Monotypic. The tree *Adenaria floribunda* HBK. has small rose or white flowers which are highly aromatic. This fragrance makes it a highly desirable addition to gardens; hence, it is sometimes cultivated.

1. ADENARIA FLORIBUNDA HBK. Nov. Gen. & Spec. 6:188. 1823.

Adenaria purpurata HBK. loc. cit. 185. 1823.
Adenaria grisleoides HBK. loc. cit. 1823.
Antherylium floribundum (HBK.) Spreng. Syst. 2:475. 1825.
Antherylium grisleoides (HBK.) Spreng. loc. cit. 1825.
Antherylium purpuratum (HBK.) Spreng. loc. cit. 1825.
Adenaria parviflora Hook. Ic. Pl. 2:116. 1837.
Adenaria lanceolata Beurling, in Akad. Handl. Stockh. 124. 1854.
Adenaria floribunda var. α forma *purpurata* (HBK.) Koehne, in Mart. Fl. Bras. 13^2:344. 1877.
Adenaria floribunda var α forma *grisleoides* (HBK.) Koehne, loc. cit. 1877.
Adenaria purpurata var. *australis* Griseb. in Lorentz, Veget. Nordeste Entrerios 116, 135. 1878.
Adenaria floribunda var. *parviflora* Koehne, in Engl. Bot. Jahrb. 4:406. 1883.
Adenaria floribunda var. *microphylla* Koehne, in Engl. Pflanzenr. 4:247. 1903.

Erect shrubs or trees to 2.5 m. tall, young branches shortly villous and glandular, the bark becoming shredded whitish-silver. Leaves lanceolate, acute to acuminate at the apex, obtuse to obtusely attenuate at the base, 2.0–13.5 cm. long, 0.6–5.0 cm. wide, above dark green to purplish red, glabrous to minutely puberulent, paler beneath, villous on veins, the primary lateral veins forming an indistinct and sometimes interrupted submarginal vein; petiole 0.5–5.0 cm. long; stipules to 1.5 mm. long. Cymes gathered into axillary umbelliform clusters; peduncle 1–7 mm. long; bracts in two superposed pairs; pedicel 5–7 mm. long, occasionally subtended by a minute bracteole. Flowers trimorphic: short-styled, intermediate-styled and long-styled. Intermediate-styled flowers: hypanthium campanulate 2–4 mm. long, 3.25–4.0 mm. broad at the orifice, tomentose and glandular without, tomentose within, the calyx lobes more or less deltoid; petals 3.5–4.0 mm. long, 1.0–1.5 mm. wide, glandular without, rose or white; stamens equal or occasionally alternately unequal with antesepalous stamens one-third longer than the antepetalous, exserted, the anthers 0.5 mm. long, the filaments (when equal) 4.5–5.5 mm. long, glabrous, united at the base; ovary turbinately globose gradually narrowed into a cuneate gynophore, 1.75–2.0 mm. long, glabrous or villous, upper half glandular, the placentation axile; style 1.0–1.5 mm. long, glandular toward the base. Short-styled like the intermediate-styled except: hypanthium 2.0–3.25 mm. broad at the orifice; petals 2.0–2.75 mm. long, 0.5–1.25 mm. wide; stamens equal, exserted, the filaments 3.0–4.25 mm. long, glabrous; ovary narrowly ovoid, 1.0–1.25 mm. long, diameter 0.25–0.5 mm., upper half villous and glandular; style 0.5–1.0 mm. long. Long-styled flowers like the intermediate-styled except: petals

2.5 mm. long, 1.0–1.5 mm. wide; stamens equal, included, the filaments 1.5–2.5 mm. long; ovary turbinately globose, 1.5–2.5 mm. long, diameter 1–2 mm., upper half villous and glandular, the gynophore reduced; style 1.5–2.0 mm. long. Fruit an indehiscent ovoid capsule; seeds about 1 mm. long, 0.5 mm. wide.

Known as *fruta de pavo* in Panama.

CANAL ZONE: vicinity of Miraflores Lake, *White & White 187*; mouth of Cocoli River, *P. White 103*; Chagres, *Fendler 313*; Bohio, *Christopherson 138*; Colón to Empire, Panama Railroad, *Crawford 455*; near Gatún, *Goldman 1874*; at the town of Gatún, *Hayes 143, s. n.*; Frijoles, *Bro. Heriberto 17*; between Chagres Batteries & Fort San Lorenzo, Fort Sherman Military Reservation, *Maxon & Valentine 6995*; Old Experiment Station, 3 miles east of Panama City, *Maxon, Harvey & Valentine 7080, 7094*; Empire to Mandinga, *Piper 5487*; Pedro Miguel, *Piper 5513*; around Gamboa, alt. 20–100 m., *Pittier 3412*; Gatún, *Stevens 1345*; Las Cascadas Plantation, near Summit, *Standley 25806, 29602*; vicinity of Fort Sherman, *Standley 30935*; Darién Station, *Standley 31544*; Gamboa, *Standley 28510*; hills west of the Canal, near Gatún, *Standley 27242*; near Fort Randolph, *Standley 28677*; Ancón Hill, *Standley 25155*; Barro Colorado Island, *Kenoyer 462, Bailey & Bailey 265*; Barro Colorado Island, Miller Trail, *Shattuck 481*. PANAMÁ: between Matías Hernández and Juan Díaz, *Standley 31970*; roadside near Chepo, *Dodge 10720*.

This species has been reported as being rarely 3- or 6-merous. This is not surprising in view of the variation between 4- and 5-merous flowers within the same cluster. The panamanian material examined does not demonstrate the 3- or 6-merous condition.

Unusual stamen number is often found, that is, one more stamen than usual. This is due to chorisis, generally in the antesepalous whorl.

LECYTHIDACEAE

Trees, usually massive and tall. Leaves alternate, exstipulate, simple, pinnately veined, entire or somewhat incised, usually large and clustered toward the tips of the branches. Inflorescence variously racemose or paniculate, usually few-flowered, terminal or lateral, occasionally cauliflorous. Flowers perigynous to epigynous, perfect, regular or zygomorphic, usually large and showy; perianth dichlamydeous but the calyx frequently reduced to inconspicuous teeth or a low rim, the petals 4–12, rather fleshy; stamens numerous and in several centripetally decreasing series, the filaments frequently more or less fleshy and petalaceous, united at the base into a common androphore which may be radially symmetrical and wholly fertile or strongly zygomorphic with a very prominent posterior, usually staminodial hood involute over the low disc of the anterior fertile stamens, the anthers basifixed, dehiscing longitudinally or rarely by terminal pores; pistil 2- to 6-carpellate, the ovary inferior or subinferior, 2- to 6-celled, with 2 to numerous anatropous ovules borne apically, laterally, or basally upon the axile placenta, the style usually very short, the stigma radiate to capitate. Fruit very rarely a large 1-seeded berry with thin subcoriaceous flesh, but usually a large woody or fibrous pyx, indehiscent or dehiscent by a circumscissile operculum; seeds characteristically large and massive, rarely compressed and samaroid, sometimes accompanied by a more or less arillate

funicle and fetid pulp derived from the placenta and endocarp, exalbuminous, the embryo differentiated or undifferentiated.

The Lecythidaceae (*sensu stricto*) are wholly American in distribution and are particularly abundant in the Amazonian rain forest or *hylaea*, extending northward in sharply decreasing numbers as far as British Honduras. Fifteen genera are recognized by Knuth in his treatment of the family for Engler's 'Das Pflanzenreich (4^{219a}:1–146. 1939).' The trees include some of the tallest and most massive of the forest and consequently are poorly collected. In Panama they occur mostly as incidental specimens rather than in aggregated stands or groves.

Although the flowers are most attractive and curious, the thick-walled fruits are even more striking, particularly those of *Lecythis*, *Eschweilera*, and *Couratari*, which resemble nothing so much as crude earthenware pots. The characteristically large hard-shelled seeds represent the family the world over in the Brazil-nut of commerce (*Bertholletia excelsa* HBK.).

As with several other intricate families of plants, the name of Lecythidaceae is inseparably associated with that of John Miers, who as an English mining engineer spent eighteen of his early years in Chile, Argentina and Brazil. During his residence in South America, quite without the benefit of special training in the subject, without libraries or herbaria, botany became for Miers an avocation quite as absorbing and exacting as his profession of mineralogy and metallurgy, and he proceeded to accumulate an incredible mass of original notes and sketches of various critical plant families to the elaboration and publication of which he devoted the remainder of his life in England until his death in 1879 at the age of ninety-one years.

Thirty-six years after his return to Britain and at the age of eighty-five, Miers published his memoir 'On the Lecythidaceae' (in Trans. Linn. Soc. 30^2:157–318. 1874) which is the embodiment of his voluminous personal information discovered in the field in South America and supplemented by subsequent studies in the libraries and museums of Europe. Whatever criticism may be directed against the occasional unreality of his taxonomic concepts, the fact remains that little has been added to our biological knowledge of the family in intervening years.

The recent treatment of Knuth, to which reference already has been made, is an improvement over that of Miers in that it includes analytical keys and the citation of considerably more numerous specimens, as might be expected. It is a compilation without much original insight, nevertheless, and depends in the final analysis upon the first-hand knowledge of Miers. The keys, too, present a constant problem since they are divided into geographic couplets for the most part and because of the unfortunate fact that most species are represented by only one or a very few herbarium sheets either in flower or in fruit but seldom both. The possibility of replicate species therefore is great. Of chief aid in the study of the species of Panama is the short study by Pittier (in Contr. U. S. Nat. Herb. 26:1–14. 1927) on the Lecythidaceae of Central America which has the advantages as well, perhaps, as some of the disadvantages of extensive field study.

a. Androphore radially symmetrical, wholly fertile.
  b. Flowers large and showy; petals 6–12; anthers dehiscing by apical pores; Fruit a mediocre pyx containing few to several seeds, dehiscing through deliquescence or irregular shredding of the operculum..... 1. GUSTAVIA
  bb. Flowers small or mediocre; petals 4; anthers dehiscing longitudinally; fruit a mediocre coriaceous or fleshy indehiscent berry usually containing a large solitary seed..... 2. GRIAS
aa. Androphore strongly bilaterally symmetrical, produced into a prominently involute, usually staminodial posterior hood.
  b. Stamens of the hood wholly fertile; ovary 6-celled; fruit a large globose coriaceous indehiscent berry, the seeds several, lateral, ovoid, immersed in fetid pulp..... 3. COUROUPITA
  bb. Stamens of the hood sterile at least in part.
    c. Hood simply involute, wholly staminodial, or the lower stamens sometimes fertile; ovary 4-celled; fruit a large woody subglobose dehiscent pyx, the seeds several, pendulous, thick and angular, with greatly enlarged fleshy funicles..... 4. LECYTHIS
    cc. Hood spirally involute, wholly staminodial; ovary 2-celled; fruit a mediocre woody or subcoriaceous depressed-campanulate dehiscent pyx, the seeds several, basal, sessile, thick and angular..... 5. ESCHWEILERA
    ccc. Hood spirally involute then reversely revolute, wholly staminodial; ovary 3-celled; fruit a mediocre coriaceous narrowly campanulate dehiscent pyx, the seeds several, basal, very thin and broadly winged. 6. COURATARI

1. GUSTAVIA L.

GUSTAVIA L. Pl. Surinam. 18. 1775, nom. conserv.

Japarandiba Adans. Fam. 2:448. 1763, nom. rejic.
Pirigara Aubl. Hist. Pl. Guian. 1:487. 1775, pro parte.
Teichmeyeria Scop. Introd. 267. 1777.
Spallanzania Neck. Elem. 2:79. 1790.

Trees, frequently of gigantic size, rarely shrubby, the leafy twigs ordinarily stout. Leaves usually crowded toward the tips of the twigs, petiolate to sessile, usually conspicuously serrate and large, occasionally rather small for the family and entire or subentire. Flowers usually lateral and cauliflorous, occasionally terminal or subterminal. Hypanthium broadly urceolate, smooth or indefinitely, rarely conspicuously, winged or ribbed. Calyx manifest or reduced to a more or less obscurely 4- to 6-lobed ring. Petals 6–12, rather unequal, large and showy. Androphore radially symmetrical, wholly fertile, the elongate inflexed fleshy filaments of the innumerable stamens coherent at the base into a shallow perigynous ring adnate to the base of the corolla; anthers narrowly cylindrical, dehiscent by 2 apical pores. Ovary 4- to 8-celled, containing numerous lateral anatropous ovules on a stout axile placenta; style conic, the stigma 4- to 8-radiate. Fruit a mediocre pyx containing few to several seeds, dehiscing through deliquescence or irregular shredding of the operculum. Embryo differentiated, with fleshy cotyledons and minute hypocotyl and plumule.

About 40 to 50 species from Costa Rica to Peru and Brazil; one or two species in the Lesser Antilles.

a. Calyx lobes clearly differentiated, 6- to 7-cleft to the hypanthium, foliaceous, accrescent and persistent in fruit; fruit relatively small, longitudinally ribbed or winged, probably dry and dehiscent through shredding of the operculum.

b. Flowers supported by a slender 2-bracteolate pedicel, conspicuously ferruginous-tomentellous, the petals 1.5–2.0 cm. long; pyx turbinate, nearly twice as broad as long, densely ferruginous-tomentellous; leaves essentially entire..... 1. G. PLEUROCARPA

bb. Flowers without a proper pedicel, the hypanthium immediately subtended by 2 small bracteoles, indefinitely ferruginous-papillate, the petals 4.0–4.5 cm. long; pyx cylindric-campanulate, about as long as broad, glabrous or essentially so; leaves rather obscurely undulate-serrate..... 2. G. BRACHYCARPA

aa. Calyx reduced to a more or less obscurely 4- to 6-lobed ring, obscure and not accrescent in fruit; fruit relatively large, not clearly ribbed or winged, probably more or less pulpy and dehiscent through deliquescence of the operculum.

b. Leaves mediocre, up to about 4 cm. long, with proportionally long petioles, oblong-lanceolate; flowers about 6 cm. in diameter; pyx not very fleshy, the pericarp about 5 mm. thick, the operculum large, as broad as the body of the fruit..... 3. G. NANA

bb. Leaves large, up to about 10 dm. long, with proportionally short petioles, elliptic-oblanceolate; flowers 10–15 cm. in diameter; pyx very fleshy, the pericarp about 5–10 mm. thick, the operculum small, about one third as broad as the body of the fruit..... 4. G. SUPERBA

In the strict sense, Linnaeus' *Gustavia* would embrace only the last two species of the key and Aublet's *Pirigara* the first two. It is indeed a great temptation to separate the two groups generically, but it is resisted here for the very cogent fact that we must qualify the description of the fruits by the adverb "probably." Aublet himself, however, describes the fruit of *Pirigara hexapetala* (= *Gustavia hexapetala* (Aubl.) Sm.), which would coincide with the former group, as "sèche", while Miers (loc. cit. p. 159) reports that in *Gustavia*, supposedly of the latter group, "on the ripening of the fruit, the dissepiments and placentae become resolved into a pulp, which envelopes the seeds, all escaping together *with the decay of the operculum* [italics ours]."

Whether the fruits differ or no, it is clear that such recent authors as Eyma (in Fl. Surinam. 3^1:121. 1934) and Pittier (loc. cit. 2. 1927) err in characterising the fruits as indehiscent without any qualification. It is impossible to understand why Pittier, particularly, could actually key *Gustavia* upon such a statement immediately before describing *G. pleurocarpa* Pitt. and *G. brachycarpa* Pitt., the type collections of which, gathered by Pittier himself, include abundant dry, empty pyxes with perfectly round opercular openings. I have also seen similar fruits with very definite opercular openings upon specimens of *G. hexapetala*, as has my friend Noel Y. Sandwith, of Kew, for *G. laciniosa*.

Insofar as floral characters distinguishing *Pirigara* and *Gustavia* are concerned, other than the natures of the calyx, I have been able to observe only that the anthers of *Gustavia* are proportionally more elongate and deeply sulcate than those of *Pirigara*. The flowers themselves of *Gustavia*, however, are most usually densely cauliflorous while those of *Pirigara* are more in smaller terminal or subterminal clusters. In short, the problem appears insoluble upon our present evidence, and is commended to the attention of future collectors in the field.

1. GUSTAVIA PLEUROCARPA Pittier, in Contrib. U. S. Nat. Herb. 26:4. 1927.

Trees up to 20 m. tall, with stout straight trunks; leafy twigs slender. Leaves

rather distant, distinctly petiolate, the blade elliptic to elliptic-obovate, rather abruptly acuminate, obtusely cuneate and somewhat decurrent to the petiole, 8–20 cm. long, 4–8 cm. broad, glabrous, firmly membranaceous, essentially entire; petiole 1.5–2.0 cm. long. Flowers terminal or subterminal, solitary or paired; peduncle about 2 cm. long, rather stout, 2-bracteate at about the middle, densely ferruginous-tomentellous; hypanthium broadly turbinate, about 7 mm. high and 10 mm. wide, densely ferruginous-tomentellous, longitudinally winged alternate with the calyx lobes; calyx lobes 6, broadly triangular, acute, about 8 mm. long, thickly foliaceous, densely ferruginous-tomentellous; petals 6, yellowish white, broadly ovate, nearly equal, 2.5–3.0 cm. long, densely ferruginous-tomentellous without and within minutely so. Somewhat immature fruits turbinate, about 8 mm. high and 18 mm. in diameter, crowned by the somewhat accrescent persistent calyx lobes, densely ferruginous-tomentellous without, not very prominently winged.

Lowland forests of the Atlantic watershed, Panama, Colombia.

COLÓN: Loma de la Gloria, near Fató (Nombre de Dios), *Pittier 3857, 4104, 4426.*

I doubt very much that this species actually is distinct from G. *hexapetala*, but I do not feel competent to make the reduction.

Fig. 36. *Gustavia brachycarpa*

2. GUSTAVIA BRACHYCARPA Pittier, in Contrib. U. S. Nat. Herb. 26:3. 1927.

Trees 5–15 m. tall, with stout straight trunks; leafy twigs slender. Leaves rather distant, distinctly petiolate, the blade obovate-elliptic, rather abruptly and narrowly acuminate, obtusely cuneate and somewhat decurrent to the petiole, 9–22 cm. long, 3–8 cm. broad, glabrous, firmly membranaceous, rather obscurely undulate-serrulate; petiole 1–2 cm. long. Flowers terminal or subterminal, solitary or in pairs; peduncle rather slender, 1–2 cm. long in flower, accrescent and decurrently winged in fruit; hypanthium turbinate, broadly winged, about 5 mm. high

and 8 mm. broad, minutely ferruginous-papillate; calyx lobes 6, broadly triangular, about 12 mm. long, thickly foliaceous, ferruginous-papillate; petals 6, white, broadly oval, nearly equal, 4.0–4.5 cm. long, minutely ferruginous-papillate without and within. Mature fruits cylindric-campanulate, about 3 cm. long and 2 cm. broad, gradually decurrent to the accrescent winged peduncle, crowned by the accrescent persistent calyx lobes, essentially glabrous without.

Lowland forests and swamps of the Pacific watershed, Panama.

CHIRIQUÍ: vicinity of San Félix, *Pittier 5269*; west of Remedios, *Allen 787*.

The beautiful and informative fruits of *Pittier 5269* have been discussed above. *Allen 787* is in flower. This must correspond to Seemann's (Bot. Voy. H.M.S. Herald 126. 1853) record of *Lecythis coriacea* DC. from Remedios, which he calls *ollito* (little pot-tree), doubtless with reference to the dry dehiscent fruits. With great significance from the standpoint of our argument Seemann reports the vernacular name of the true Gustavias as *membrillo* (quince tree), which is in wide use in Panama to the present day.

3. GUSTAVIA NANA Pittier, in Contrib. U. S. Nat. Herb. 26:5. *pl. 3–4*. 1927.

Gustavia rhodantha Standl. in Field Mus. Publ. Bot. 4:239. 1929.

Shrubs or small trees to about 9 m. tall; leafy twigs rather slender. Leaves congested seasonally toward the tips of the branches, of mediocre size for the genus and with proportionately long slender petioles, the blade rather narrowly oblong-lanceolate, up to about 4 dm. long and 8 cm. broad, rather gradually and acutely acuminate, more abruptly cuneate at the base, rather obscurely and distantly undulate-serrulate, membranaceous, glabrous; petiole variable in length, about 3–15 cm. long. Flowers mostly densely cauliflorous beneath the terminal cluster of leaves; peduncle corymbosely several-flowered; hypanthium depressed-turbinate, about 7 mm. broad and 5 mm. long at anthesis; calyx reduced to an obscurely 4-lobed ring 1.5–2.0 cm. in diameter, minutely puberulent-papillate; petals 6–8, more or less unequal, oblong-obovate, deep pink, 2.5–3.5 cm. long, densely papillate. Mature fruits subglobose, up to about 7 cm. in diameter, the opercular region of about equal diameter, not very fleshy, the pericarp about 5 mm. thick.

Apparently endemic to Panama, in lowland forests.

COLÓN: Loma de la Gloria, near Fató (Nombre de Dios), *Pittier 4093*. DARIÉN: near mouth of Río Yapé, *Allen 349*; Marragantí and vicinity, *Williams 655*. SAN BLAS: Permé, *Cooper 239*.

4. GUSTAVIA SUPERBA (HBK.) Berg, in Linnaea 27:444. 1856.

Pirigara superba HBK. Nov. Gen. & Spec. 7:261. 1825.
Gustavia insignis Linden, ex Hook. Bot. Mag. *pl. 5069*. 1858.
Gustavia superba var. *salviniae* Hemsl. Biol. Centr.-Am. Bot. 1:413. 1880.
Japarandiba superba (HBK.) O. Ktze. Rev. Gen. 240. 1891.

Trees to about 20 m. tall, with stout straight trunks, branching infrequently; leafy twigs rather stout. Leaves congested seasonally toward the tips of the branches, usually very large and with proportionally short and stout petioles, the

Fig. 37. *Gustavia superba*

blade elliptic-oblanceolate, up to about 10 dm. long and 2 dm. broad, rather abruptly and acutely acuminate, narrowly cuneate and more or less decurrent to the petiole, coarsely to rather obscurely undulate-serrate, membranaceous, glabrous; petiole 2–9 cm. long. Flowers mostly densely cauliflorous beneath the terminal cluster of leaves; peduncle stout, usually about 6 cm. long, corymbosely several-flowered; hypanthium turbinate, about 1.5 cm. long and broad at anthesis; calyx reduced to a more or less obscurely 4-lobed ring 1.5–2.0 cm. in diameter, densely puberulent-papillate; petals 6–12, more or less unequal, oblong-obovate, white, usually yellowish at the base and more or less tinged with pink or lavender toward the tip, 4–7 cm. long, minutely papillate. Mature fruits depressed-globose, up to about 8 cm. broad and 6 cm. long, the opercular region about one third as broad, very fleshy, the pericarp about 5–10 mm. thick.

Costa Rica to Ecuador, in lowland forests. *Membrillo.*

CANAL ZONE: hospital grounds, Ancón, *Mason s. n., Pittier 2746*; Ft. Sherman, *Standley 30955*; Darién Station, *Standley 31553*; Río Paraíso, above East Paraíso, *Standley 29917*; old site of Gorgona, *Maxon 6787*; Gatuncillo, *Stevens 1159*; Obispo, *Standley 31709*; hills north of Frijoles, *Standley 27443*; near mouth of Río Chagres, *Allen 880, 856*; Monte Lirio, *Christopherson 128*; Empire, *Christopherson 197*; Barro Colorado Island, *Standley 31447*; Salamanca Hydrographic Station, Río Pequení, *Woodson, Allen & Seibert 1582*; Gamboa, *Standley 28389, Stevens 1090*; Las Cascadas, near Summit, *Standley 25716, 29591*; Chagres arm of Gatún Lake, *Maxon 6554*; Matachín to Las Cascadas, *Cowell 328*. COCLÉ: El Valle de Antón, alt. 600 m., *Allen 4206*; Bismarck above Penonomé, 2000–3000 ft. elev., *Williams 435*. DARIÉN: Pinogana, *Allen 4310*; Marragantí and vicinity, *Williams 693*. PANAMÁ: Pacora, *Bro. Paul 341*; Juan Díaz region, *Maxon & Harvey 6746a*; Taboga Island, *Standley 27934*; Taboguilla Island, *Miller 1998*; Trapiche, Perlas Islands, *Allen 2610, Miller 1874*; San José Island, *Erlanson 495, Johnston 282*.

The enormous leaves crowded toward the ends of the branches render the *membrillo* very conspicuous. Although the trees do not pass through consecutive leafy and leafless stages, as do some in the tropics, and always are in leaf, their growth is in definite cycles and the leaves are produced in well marked "flushes." Preceeding such a flush, large terminal buds resembling those of the temperate hickories are produced. As the first leaves develop from these buds the nodes and subsequent leaf scars are conspicuously congested.

Freshly cut wood and wilting leaves of the *membrillo* produce an offensive odor of putrifaction which has earned for the trees the suggestive name of *palo de muerte* in some localities. This is apparently a quality shared by other Gustavias, one species of Venezuela having been named G. *fustis-mortui* by Pittier. The fruit is produced toward the end of the dry season from February to April on the Pacific slope. It consists of a brown or greenish rind enclosing numerous large brown seeds surrounded by an orange pulp which is reputedly edible, as the name *membrillo* (quince) suggests, but according to Dr. I. M. Johnston is scarcely palatable.

2. GRIAS L.

GRIAS L. Syst. ed. 10. 1075. 1759.

Pirigara Aubl. Hist. Pl. Guian. 1:487. 1775, pro parte.

Fig. 38. *Grias pittieri*

Large trees, the leafy twigs stout and fistulose. Leaves usually crowded toward the end of the twigs, ordinarily sessile or subsessile. Flowers few to several in dense umbelliform cauliflorous clusters. Hypanthium urceolate. Calyx nearly entire to broadly and irregularly 4-lobed, not prominent in fruit. Petals 4, rarely 5, subequal, rather small for the family. Androphore radially symmetrical, wholly fertile, the elongate inflexed fleshy filaments of the innumerable stamens coherent at the base into a shallow perigynous ring; anthers small and ovoid, dehiscing longitudinally. Ovary 4-celled at anthesis, each cell containing 2–4 pendulous ovules, but usually only 1 cell and 1 ovule developing in fruit; stigma sessile, 4-radiate, inserted on a prominent square disc. Fruit a rather mediocre coriaceous or fleshy pyriform indehiscent berry usually containing a single seed, the opercular region and calyx obscure.

About a dozen species, according to Knuth, extending from British Honduras to the Guianas and Peru, and with one species in Jamaica. The trees are rather similar to those of *Gustavia* in their stature and large leaves.

a. Leaves very large, about 6–10 dm. long and 2–4 dm. broad; flowers relatively large, the petals about 1.5–2.0 cm. long. Atlantic slope..... 1. G. FENDLERI
aa. Leaves mediocre, about 4.0–4.5 dm. long and 5–16 cm. broad; flowers relatively small, the petals about 8–10 mm. long. Pacific slope..... 2. G. PITTIERI

1. GRIAS FENDLERI Seem. Bot. Voy. H.M.S. Herald 126. 1854.

Trees to about 15 m. tall. Leaves sessile or subsessile, the blade obovate-spatulate, shortly and abruptly acuminate to broadly rounded at the tip, gradually attenuate from above the middle to a decurrent subpetiolar base, about 6–10 dm. long and 2–4 dm. broad, subcoriaceous, glabrous. Flowers in small umbelliform cauliflorous clusters; hypanthium about 3 mm. long and 2 mm. broad; calyx frequently nearly entire in bud, but at anthesis usually splitting into 4 rather broad lobes about 2 mm. long; petals 4, white or cream, about 1.5–2.0 cm. long. Fruit unknown.

BOCAS DEL TORO: Fish Creek hills, vicinity of Chiriquí Lagoon, *Von Wedel 2423*. CANAL ZONE: Chagres, *Fendler* 187.

2. GRIAS PITTIERI R. Knuth, in Engl. Pflanzenr. 4[219a]:29. 1939.

Trees up to about 10 m. tall. Leaves sessile or subsessile, the blade oblanceolate-spatulate, shortly and acutely acuminate, gradually attenuate from near the tip to a decurrent subpetiolar base, about 4.0–4.5 dm. long and 5–16 cm. broad, subcoriaceous, glabrous. Flowers in small umbelliform cauliflorous clusters; hypanthium about 2 mm. long and 1.5 mm. broad; calyx nearly entire in the bud but at anthesis usually splitting into 4 irregular broad lobes about 1.5 mm. long; petals 4 or rarely 5, white, about 8–10 mm. long. Fruit pyriform, 2–3 cm. long, 2.0–2.5 cm. broad, gradually attenuate to a persistent pedicel of nearly equal length, greenish brown.

Pacific coast of Panama, in lowland forests. Cooper and Slater report the vernacular names *jaguey* and *membrillo*.

CHIRIQUÍ: vicinity of Puerto Armuelles, *Woodson & Schery 901*; Progreso, *Cooper & Slater 228*. DARIÉN: around Pinogana, *Pittier 6552*; trail between Pinogana and Yavisa, *Allen 273*.

It is unfortunate that intermediate stations between Chiriquí and Darién have not been found. While the leaves of the two populations are quite similar, both specimens from Chiriquí are in fruit and both from Darién are in flower only, and their correlation thus is in doubt to that degree.

3. COUROUPITA Aubl.

COUROUPITA Aubl. Hist. Pl. Guian. 708. 1775.

Pontopidiana Scop. Introd. 195. 1777.
Elsholtzia Neck. Elem. 2:256. 1790.
Pekea Juss. Gen. 249. 1798, pro parte.

Trees of moderate to gigantic size, the leafy twigs ordinarily stout. Leaves crowded toward the tips of the twigs, shortly petiolate, broadly obovate-cuneate and rather small for the family, entire to serrulate. Flowers in extensive subterminal to cauliflorous racemes and panicles. Hypanthium broadly obovoid. Calyx deeply 6-lobed, inconspicuous in fruit. Petals 6, more or less unequal, white more or less suffused with red. Androphore strongly bilaterally symmetrical, wholly fertile, produced into a prominent simply involute posterior hood, the stamens of the hood somewhat larger and with longer filaments than those of the central disc; anthers very small and ovoid, dehiscing longitudinally. Ovary 6-celled, containing numerous lateral anatropous ovules; stigma sessile, 6-radiate, inserted on a prominent round disc. Fruit a large globose indehiscent coriaceous berry, the seeds several, compressed, of moderate size, immersed in fetid pulp, the embryo differentiated and with fleshy cotyledons.

About 19 species according to Knuth, extending from Nicaragua to Amazonian Peru and Brazil and in Jamaica and the Lesser Antilles. *Couroupita guianensis* Aubl., known in English as Cannon-ball Tree, is occasionally cultivated in tropical parks and gardens. The handsome, usually reddish flowers vary from 3 to 9 cm. in diameter, and the large globular fruits may be 2 dm. in diameter.

In prefacing his account of the Couroupitas of Central America Pittier wrote, "Owing to the scarcity of the cannon-ball trees, it has been found difficult to obtain satisfactory specimens. For this reason the three following species are incompletely described." Knuth, although presenting detailed descriptions, generates even less confidence by his key to the species of Central America, which is reproduced below for the possible use of the reader:

B. Species centrali-americanae.
  a. Nicaragua; Costarica: flos ad 7 cm diam..... 15. *C. nicaraguensis*
  b. Panama.
    α. Flos 8–9 cm diam..... 16. *C. Cutteri*
    β. Flos 7–8 cm diam..... 17. *C. darienensis*
    γ. Flos 4–5 cm diam..... 18. *C. odoratissima*
    δ. Flos 3 cm diam..... 19. *C. paviflora*

In his key to the three Central American species recognized by him, Pittier

Fig. 39. *Couroupita guianensis*

distinguishes *C. odoratissima* Seem. as a "low spreading savanna tree, branched almost from the base" and *C. nicaraguensis* DC. and *C. darienensis* Pittier as "high forest trees"; yet Seemann assigns a height of 60–80 feet to the type trees of *C. odoratissima*. *Couroupita cutteri* Morton & Skutch and *C. parviflora* Standl. both are reported only through single collections in the immediate vicinity of the Chiriquí Lagoon.

Since a total of only three herbarium specimens is available for our study at present, it appears quite impossible to treat the species in the usual way since the leaves are nearly, if not quite, identical and the dimensions of the flowers analysed by Knuth present a continuum (the flowers of the type specimen of *C. parviflora* obviously are not fully expanded). The three specimens examined for the present account are as follows:

BOCAS DEL TORO: 15 mi. from Almirante, *Skutch 19* (type of *C. cutteri* in U. S. Nat. Herb.); Changuinola valley, *Cooper & Slater 11* (type of *C. parviflora* in U. S. Nat. Herb.). DARIÉN: forests around Pinogana, *Pittier 6563* (type of *C. darienensis* in U. S. Nat. Herb.).

The type specimen of *C. odoratissima* was collected by Seemann in the forests of Río de Jesús, between Santiago and Puerto Mutis, Veraguas. According to Pittier, the species since has been seen by Dr. Otto Lutz in forests of Hato de San Juan, between San Lorenzo and San Félix, eastern Chiriquí, but the photograph to which he refers is not included in the U. S. National Herbarium.

An adequate herbarium representation of *Couroupita* is one of the outstanding desiderata for a complete Flora of Panama. Seemann was informed by local residents that *C. odoratissima* was to be found only in a small area at the type locality. Failure of recent collectors to find more ample material suggests that the species, one or several, must be extremely local and infrequent.

5. LECYTHIS Loefl.

LECYTHIS Loefl. It. Hisp. 189. 1758.

Bergena Adans. Fam. 2:345. 1763, nec Neck. nec Raf.

Large trees. Leaves large and coriaceous, or unusually small for the family, entire to crenulate, usually not congested at the tips of the twigs. Flowers in subterminal or axillary panicles. Hypanthium obovoid. Calyx deeply 6-lobed, becoming a more or less prominently thickened and approximately median rim in fruit. Petals 6, unequal. Androphore strongly bilaterally symmetrical, produced into a prominent posterior simply involute wholly or partially staminodial hood concealing the low staminiferous central disc; anthers ovoid, dehiscing longitudinally. Ovary 4-celled, with several pendulous anatropous ovules; stigma sessile, 4-radiate. Fruit a large woody subglobose dehiscent pyx, the seeds several, large and angulate, pendulous from the greatly enlarged fleshy funicles, the embryo undifferentiated.

About 50 species, according to Knuth, extending from Costa Rica to southern Brazil, and in the Lesser Antilles. The trees are amongst the largest of the tropical

American forests, and the hard wood is used structurally. The large fruits resemble aboriginal pottery, hence the Spanish vernacular *olla de mono* and the English Monkey-pot. The trees and their timber are known as *cocobolo* in Panama and Costa Rica.

Pittier (in Contrib. U. S. Nat. Herb. 26:8. 1927) recognized four species of *Lecythis* in Panama, basing them chiefly upon rather obscure differences seen in the fruits. In an earlier paper on the Lecythidaceae of Costa Rica (loc. cit. 12:95–101. 1908), however, he included a photograph of several fruits of *L. costaricensis* which displays striking variance and casts considerable doubt upon the reality of his subsequent species. Only two species are recognized here.

a. Leaves large and coriaceous, about 20–50 cm. long, entire or essentially so; pyx with the margin of the orifice convex, rough and irregularly muricate with the bases of the abscissed veins, the calycine rim indefinitely erose or subentire. Pacific slope..... 1. L. TUYRANA
aa. Leaves small and membranaceous, about 8–10 cm. long, finely crenulate; pyx with the margin of the orifice concave, relatively smooth and with little evidence of abscissed veins, the calycine rim conspicuously 6-lobed. Atlantic slope..... 2. L. AMPLA

1. LECYTHIS TUYRANA Pittier, in Contrib. U. S. Nat. Herb. 26:9. *pl. 7.* 1927.

Lecythis melliana Pittier, loc. cit. 8. *pl. 6.* 1927.

Large trees to about 30 m. tall, the leafy twigs stout and thinly rimose. Leaves large and coriaceous, broadly oblong to oval, abruptly and shortly acuminate, rounded and inconspicuously decurrent at the base, about 20–60 cm. long and 6–20 cm. broad, entire, glabrous; petiole stout and canaliculate, 1–2 cm. long. Inflorescence paniculate, many-flowered, the stout puberulent peduncle about as long as the subtending leaves. Flowers sessile; calyx lobes broadly ovate to reniform, obtuse or rounded, 6–8 mm. long; petals oval, 2.5–3.0 cm. long, yellow. Fruit subglobose, deep brown and roughly verrucose, 10–15 cm. long and broad, the calycine rim indefinitely erose to subentire, median or submedian, the margin of the orifice convex, rough and irregularly muricate with the bases of the abscissed veins.

Pacific slope of eastern Panama, in lowland forests; sometimes planted for ornament in the Canal Zone.

CANAL ZONE: near firehouse, Balboa, *Standley 26898*; Balboa, *Standley 30867, Johansen 32.* DARIÉN: Pinogana, *Pittier 6576, 6538.*

2. LECYTHIS AMPLA Miers, in Trans. Linn. Soc. 30:204. *pl. 43, figs 1–2.* 1874.

Lecythis armilensis Pittier, in Contrib, U. S. Nat. Herb. 26:9. *pl. 8.* 1927.

Large trees to about 40 m. tall, the leafy twigs remarkably slender. Leaves relatively small and membranaceous, broadly elliptic, abruptly and rather shortly subcaudate-acuminate, obtuse at the base, about 8–10 cm. long, finely crenulate, glabrous; petiole slender, about 5 mm. long. Flowers unknown to us. Fruit globose-subampullaceous, yellowish brown and finely granular, not verrucose, 15–20 cm. long, 12–15 cm. broad, the calycine rim at the upper third and distinctly 6-lobed, the margin of the orifice concave, relatively smooth and with little evidence of the abscissed veins.

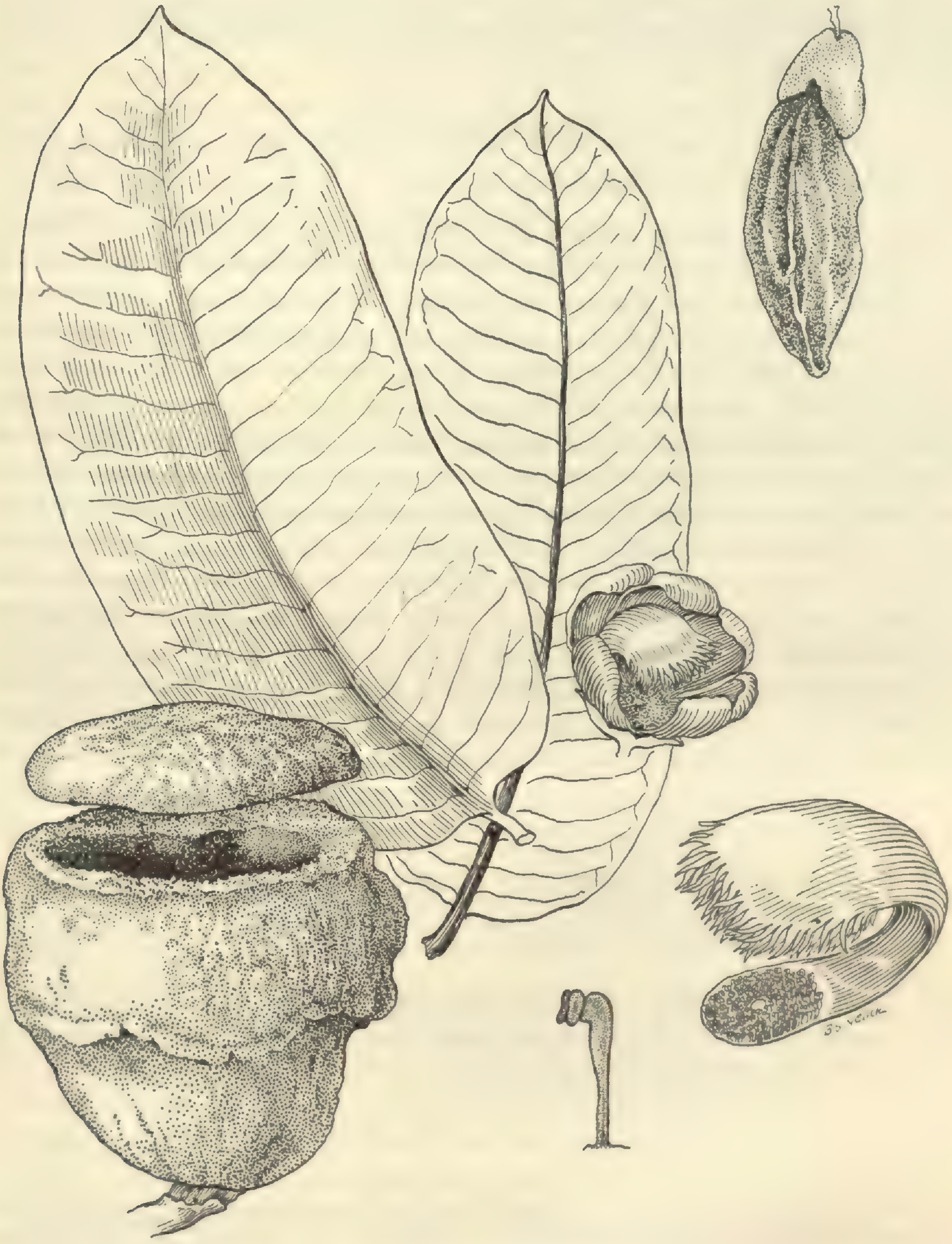

Fig. 40. *Lecythis tuyrana*

Atlantic lowlands of Panama; Colombia.

SAN BLAS: hills of Sperdí, near Puerto Obaldía, *Pittier 4343*.

I have not seen the old fruits, also from Puerto Obaldía, upon which Pittier based *L. armilensis*, but the photographs appear to be essentially similar to those of *L. ampla* and well within the range of expected variance.

6. ESCHWEILERA Mart.

ESCHWEILERA Mart. ex DC. Prodr. 3:293. 1828.

Large trees. Leaves rather large and coriaceous, entire in our species, usually not congested at the tips of the twigs. Flowers in subterminal or axillary panicles or racemes. Hypanthium obovoid. Calyx deeply 6-lobed, usually less than half adnate to the fruit in our species, becoming more or less prominently thickened in fruit or rarely (*E. calyculata*) retaining their coriaceous texture. Petals 6, more or less unequal (of abnormally thin texture in *E. panamensis*). Androphore strongly bilaterally symmetrical, produced into a prominent spirally involute staminodial posterior hood concealing the relatively few minute fertile stamens of the central disc. Ovary 2-celled, each with several nearly sessile erect basal ovules; stigma capitate and essentially entire, sessile or borne upon a prominent stylopodium. Fruit a mediocre, woody or subcoriaceous, depressed-campanulate, dehiscent pyx, the seeds several, basal, sessile, thick and angulate, the embryo undifferentiated.

This is the largest genus of Lecythidaceae, consisting of over 90 species according to Knuth, and extending from Costa Rica to central Brazil. The trees are generally similar to *Lecythis*, but do not attain such great size in Panama.

a. Flowers relatively small, about 1.5–2.0 cm. in diameter, the petals thin in texture, the calyx lobes 1–2 mm. long; peduncles slender and paniculate, characteristically branched toward the base; leaves rather small, usually about 6–12 cm. long. Atlantic slope: San Blas..... 1. E. PANAMENSIS

aa. Flowers relatively large, about 2.5–3.5 cm. in diameter, the petals thick in texture, the calyx lobes 6–9 mm. long; peduncles thick and racemose, characteristically unbranched; leaves rather large, usually about 15–35 cm. long.

b. Pyx very thickly woody, the pericarp about 1 cm. thick or more, the calyx lobes adnate to about midway of the pyx and becoming very prominent and woody. Pacific slope: Chiriquí..... 2. E. PITTIERI

bb. Pyx thin and subcoriaceous, the pericarp scarcely more than 2 mm. thick, the calyx lobes adnate to the base of the pyx.

c. Calyx lobes strongly adnate, not accrescent, becoming vestigial in fruit; leaves elliptic-oblong, narrowly and acutely subcaudate-acuminate. Pacific slope: Darién..... 3. E. GARAGARAE

cc. Calyx lobes weakly adnate, accrescent and prominent in fruit; leaves obovate-oblong, obtuse or rounded to abruptly and obtusely acuminate. Atlantic slope: Bocas del Toro and Colón..... 4. E. CALYCULATA

1. ESCHWEILERA PANAMENSIS Pittier, in Contrib. U. S. Nat. Herb. 26:12. 1927.

Eschweilera reversa Pittier, loc. cit. 11. 1927, pro parte?

Trees up to 25 m. tall, the leafy twigs relatively slender. Leaves shortly petiolate, oval, very abruptly and shortly acuminate or obtuse at the tip, broadly

obtuse or rounded at the base, about 8–12 cm. long, 3–8 cm. broad, coriaceous, glabrous; petiole rather stout, about 5 mm. long. Inflorescence subterminal and axillary, paniculate, many-flowered, somewhat longer than the subtending leaves, the peduncle slender and minutely puberulent. Flowers relatively small, about 1.5–2.0 cm. in diameter; calyx lobes deltoid, 1–2 mm. long; petals unequal, about 1 cm. long, yellow, thin in texture for the family. Fruit (according to Pittier) "globose-depressed, about 4 cm. long and 5 cm. in diameter, 2-celled, slightly attenuate at base, with rather thin walls; calycinal zone bearing the persistent enlarged lobes of the calyx, the interzonal band 1.5–2.0 cm. broad."

Lowland forests of Atlantic slope, Panama.

SAN BLAS: hills back of Puerto Obaldía, *Pittier 4338*.

The fruit accompanying the type specimen apparently has been lost or misplaced in the U. S. National Herbarium.

The type sheet of *E. reversa* (*Pittier 4394* in U. S. Nat. Herb.) from the Plain of Sperdí, near Puerto Obaldía, seems to be a mixture consisting of a leafy branch, possibly a *Rinorea*, and a detached pyx and operculum of an *Eschweilera*. Although it would be odd for such a veteran as Pittier to mis-associate two such unrelated plants and although I cannot be positive of the species of the leaves, I feel certain that the leaves are not from an *Eschweilera*, particularly because of their prominent linear stipules. The fruit resembles those of *E. pittieri*, of the Pacific slope of Chiriquí, very closely.

In his discussion of *E. reversa* Pittier states that the pyx and the operculum of his type sheet of the species were found detached under trees, presumably from which his leafy branch was obtained, "but since there were trees of *Eschweilera panamensis* scattered in the forest all around, the source of that lid is not absolutely certain." Under such circumstances, *E. reversa* cannot be regarded as more than a *nomen dubium* at the present time.

2. ESCHWEILERA PITTIERI R. Knuth, in Engl. Pflanzenr. 4^{219a}:93. 1939.

Eschweilera verruculosa Pittier, in Contrib. U. S. Nat. Herb. 26:13. *pl. 12.* 1927, non Miers.

Trees up to 20 m. tall, the leafy twigs relatively slender. Leaves shortly petiolate, elliptic-oblong, abruptly and rather shortly and acutely acuminate, broadly obtuse or rounded at the base, 12–30 cm. long, 6–12 cm. broad, subcoriaceous, glabrous; petiole rather stout, 1.0–1.5 cm. long. Inflorescence racemose, several- to many-flowered, much shorter than the subtending leaves, the peduncle stout and glabrous. Flowers relatively large, about 3.0–3.5 cm. in diameter; calyx lobes ovate, obtuse, approximately 1 cm. long; petals yellow or white, obovate-oblong, more or less unequal, about 2 cm. long. Fruits very thickly woody, the pericarp about 1 cm. thick or more, conspicuously brown-verruculose, particularly in the calycine zone, depressed-globose, about 2.5–5.0 cm. long and 3.5–6.0 cm. broad, the calyx lobes adnate to about midway of the pyx and becoming very prominently woody, the operculum conspicuously domed and nearly hemispheric, almost half as deep as the body of the pyx.

Fig. 41. *Eschweilera pittieri*

Lowland forests, Pacific slope of Panama.

CHIRIQUÍ: vicinity of San Félix, *Pittier 5290, 5738*; Río Tinta, along main highway, *Woodson, Seibert & Allen 402*; San Félix to Cerro Flor, *Allen 1920*; vicinity of Remedios, *Allen 3476*.

3. ESCHWEILERA GARAGARAE Pittier, in Contrib. U. S. Nat. Herb. 12:12. 1927.

Trees up to about 35 m. tall, the leafy twigs relatively slender. Leaves elliptic-oblong, narrowly and acutely subcaudate-acuminate, broadly rounded or obtuse at the base, about 12–35 cm. long and 3–12 cm. broad, membranaceous to subcoriaceous, glabrous; petiole about 1.0–1.5 cm. long. Inflorescence racemose, several-flowered, the peduncle rather stout and inconspicuously puberulent, much shorter than the subtending leaves. Flowers relatively large, about 3.0–3.5 cm. in diameter; calyx lobes broadly ovate, acute, about 6–9 mm. long; petals yellow, somewhat unequal, broadly oval, about 2 cm. long. Fruits depressed-globose, about 5 cm. long and 5.5–6.0 cm. broad, the pericarp rather thin and subcoriaceous, scarcely more than 2 mm. thick, the calyx lobes strongly adnate to the very base of the pyx, not accrescent, becoming obscure and vestigial, the operculum rather flat and not conspicuously constricted at the orifice, about one third as deep as the body of the pyx.

Lowland forests of the southeastern Pacific slope of Panama.

DARIÉN: foothills of Garagará, Sambú basin, *Pittier 5616*; vicinity of Pinogana, *Allen 920*; Marragantí on the Tuyra R., about El Real, *Pittier 6596*.

4. ESCHWEILERA CALYCULATA Pittier, in Contrib. U. S. Nat. Herb. 12:97. *pls. 1–2*. 1908.

Trees up to 10 m. tall, or apparently sometimes more than twice as tall (according to Von Wedel), the leafy twigs relatively stout. Leaves rather narrowly obovate-oblong, obtuse or rounded to abruptly and obtusely acuminate, broadly and obtusely cuneate, 13–35 cm. long, 5–15 cm. broad, coriaceous, glabrous; petiole about 1–2 cm. long. Inflorescence racemose, several-flowered, the peduncle stout and glabrous, less than half as long as the subtending leaves. Flowers relatively large, about 3.5 cm. in diameter; calyx lobes broadly ovate, acute, about 6 mm. long, greatly accrescent in fruit but retaining their coriaceous texture and only weakly adnate to the base of the pyx (according to Pittier); petals oval-obovate, about 2 cm. long, rather unequal, yellow. Fruit (according to Pittier and the cited illustrations) "7 cm. in diameter and about 6 cm. high, depressed-globose, thin-walled, rather smooth, with persistent sepals becoming twice larger than in flower", the subhemispheric operculum nearly twice as deep as the body of the pyx, not conspicuously contracted at the orifice.

Lowland forests of the northwestern Atlantic slope of Panama, and adjacent Costa Rica. Reported as *mata cansada* by Cooper and Slater.

BOCAS DEL TORO: Isla Colón, Chiriquí Lagoon, *Von Wedel 2804, 408*; Almirante region, *Cooper & Slater 57*; Changuinola valley, *Dunlap 493*. CANAL ZONE: near Fort Randolph, *Maxon & Harvey 6537, Standley 28675*.

I have not been able, as yet, to examine well-authenticated fruits of *E. caly-*

culata. The fruits labeled such in the U. S. National Herbarium to accompany *Cooper & Slater 57* certainly are Couroupitas. Since Cooper and Slater also collected *Couroupita* in the Almirante region, the fruits probably should accompany *Cooper & Slater 11*, the type sheet of *C. parviflora* Standl.

7. COURATARI Aubl.

COURATARI Aubl. Pl. Guian. 2:723. 1775.

Lecythopsis Schrank, in Denkschr. Akad. Muench. 7:241. 1821.

Gigantic trees. Leaves usually of moderate or rather small size for the family, usually membranaceous and more or less pubescent, entire or inconspicuously crenulate, usually not congested at the tips of the twigs. Flowers rather small, in terminal panicles. Hypanthium obconic. Calyx deeply 6-lobed to subentire, not accrescent, vestigial in fruit. Petals 6, subequal, usually pink or rose. Androphore strongly bilaterally symmetrical, produced into a prominent, posterior hood spirally involute then reversely revolute, wholly staminodial and concealing the rather few minute fertile stamens of the central disc. Ovary 3-celled, containing numerous basal ovules; stigma sessile or subsessile, minutely 3-radiate. Fruit a mediocre subcoriaceous narrowly campanulate dehiscent pyx; seeds several, basal, very thin and broadly winged, the embryo subcentral.

A genus of approximately 20 described species, extending from Costa Rica to central Brazil.

1. COURATARI PANAMENSIS Standl. in Field Mus. Publ. Bot. 4:239. 1929.

Gigantic trees up to about 30 m. tall, the leafy branches moderately stout, prominently angled and minutely ferruginous-hirtellous when young. Leaves broadly oval, obtuse to rounded or very abruptly and obtusely cuspidate, broadly rounded at the base, 7–18 cm. long, 5–10 cm. broad, membranaceous, more or less conspicuously ferruginous-hirtellous on the midrib and veins; petiole about 1 cm. long. Inflorescences terminal, paniculate, several- to many-flowered, the stout minutely hirtellous peduncles somewhat longer than the subtending leaves. Flowers unknown to us. Fruits cylindrical-campanulate, occasionally somewhat gibbous, 5–10 cm. long, about 3.0–3.5 cm. in diameter at the orifice, dark brown and conspicuously lenticellate; operculum strongly trigonal, permanently attached to the stout elongate placenta; seeds oblong-oblanceolate, thinly membranaceous, about 7 cm. long and 1.5 cm. broad, rich brown.

Lowland forests of the Atlantic slope of Panama; perhaps also in lowland forests of eastern Costa Rica. Barbour reports the vernacular names of *coco, coco de mono* and *coquito* in Panama.

BOCAS DEL TORO: Cricamola valley, region of Almirante, *Cooper 542.* CANAL ZONE: near Battery VII, area west of Limón Bay, Gatún Locks and Gatún Lake, *Johnston s. n.* PANAMÁ: Río Indio drainage, about 9 miles east of trans-isthmian highway, *Barbour 1059.*

These three specimens, in addition to one other from Costa Rica, are the only

Fig. 42. *Couratari panamensis*

records of *Couratari* from Central America. The three Panamanian specimens show fruit only; the Costa Rican (*Allen 5686*, from the vicinity of Río Esquinas, Puntarenas province) is in flower. Whether a single species is represented is conjectural of course. The flowers of *Allen 5686* are pink and about 1.5–2.0 cm. in diameter; they were used in the composition of the accompanying illustration.

RHIZOPHORACEAE

By DAVID P. GREGORY

Trees or shrubs, often with swollen nodes. Leaves opposite, simple, entire or serrate, with lanceolate, foliose, interpetiolar, caducous stipules. Inflorescence axillary; flowers perfect and regular, sometimes solitary but usually cymose, perigynous to epigynous. Calyx 3- to 14-merous, the calyx tube adnate to the ovary or free, valvate, persistent. Petals equal in number to the sepals, free, often unguiculate and sometimes elaborately fimbriate, convolute or inflexed in the bud. Stamens from twice the number of sepals to more numerous, in one whorl, inserted on a lobed disc; anthers usually 2-celled, sometimes many-celled (*Rhizophora*). Ovary superior, half-inferior or inferior, the locules and carpels 2–5, the septa sometimes failing to develop and resulting in a single locule; placentation axile; ovules usually 2 per locule; style single, the stigma lobes usually equal in number to the carpels. Fruit a leathery or fleshy berry crowned by the persistent calyx, usually indehiscent but sometimes septicidally dehiscent, with one locule and one seed or 2–5 locules each 1-seeded. Seeds sometimes germinating while the fruit is still on the tree (*Rhizophora*), with or without endosperm.

This family has two groups of genera, one maritime and the other of upland forest genera. The representatives in Panama include one genus of each group, *Rhizophora* of the tidal zone and *Cassipourea* of inland areas. *Rhizophora* is the more important economically. The mangroves are a factor in land building, their prop roots forming a lattice that collects silt and organic debris. The bark of these plants contains from 20 to 45 per cent of tannins, although their tannin is apparently inferior to that of some other plants used in the process of tanning. Red dyes also are obtained from the young shoots. Other uses are as firewood and charcoal, for piling, for cabinet work and for manila and craft pulp.

Economic uses of *Cassipourea* are fewer, most important being the use of its strong, flexible wood for such things as canoe paddles.

a. Leaves coriaceous; ultimate branchlets thick; inflorescences axillary and cymose; stamens 8, cuneate, sessile or subsessile, the anthers many-locular; ovary half-inferior, 2-locular; fruit a dry indehiscent berry, the seed germinating in attached fruits; plants of mangrove swamps with characteristic adventitious aerial and prop roots..... 1. RHIZOPHORA

aa. Leaves membranaceous; ultimate branchlets slim; flowers fascicled in the leaf axils or solitary; stamens 15–25 on slender filaments, the anthers 4-locular; ovary nearly superior, 3-locular; fruit a fleshy septifragal capsule; not plants of the mangrove association, roots subterranean..... 2. CASSIPOUREA

1. RHIZOPHORA L.

RHIZOPHORA L. Sp. Pl. 1:443. 1753.

Mangle Pluk. ex Adans. Fam. Pl. 2:445. 1763.
Mangium Rumph. ex Scop. Intr. Hist. Nat. 218. 1777.
Asophora Neck. Elem. Bot. 2:361. 1790.

Maritime trees and shrubs with adventitious aerial and prop roots, branchlets stout and furrowed, with prominent leaf and stipule scars. Leaves opposite, simple, entire, evergreen, coriaceous, often spotted dorsally; stipules foliose, sessile, caducous. Inflorescence axillary, cymose, persistently bracteate. Flowers perfect, regular. Sepals 4, valvate, distinct, coriaceous, reflexed and persistent in fruit. Petals 4, alternate with the sepals, involute, often with hairy margins, caducous. Stamens 8–12, introrse, sessile, in one whorl, cuneate, areolate, a membrane covering the areolae opening at the inner edge to free the pollen. Ovary half-inferior, bilocular, the superior portion conical, surrounded by a fleshy disc; style terete, the stigma bifid or rarely trifid; ovules 2 per locule. Fruit a dry berry crowned by the persistent calyx, indehiscent. Seed 1 by abortion, suspended, germinating while the fruit is still on the tree.

Several species of tidal flats and river estuaries widely distributed between the Tropic of Cancer and the Tropic of Capricorn, girdling the world.

a. Shrubs reaching 5 meters (rarely trees reaching 25 meters); inflorescence 2- to 6-flowered; floral buds ampullaceous, broadest at the base, acuminate at the tip; sepals 8–15 mm. long at anthesis; petals 5–11 mm. long; style 3–7 mm. long; bracteoles truncate-trapezoid. Either coast.
  b. Flowers relatively large at anthesis, the sepals 11–15 mm. long, the petals 9–11 mm. long, the style 5–7 mm. long. Atlantic coast..... 1. R. MANGLE
  bb. Flowers relatively small at anthesis, the sepals 8–10 mm. long, the petals 5–8 mm. long, the style 3.5–4.0 mm. long. Pacific coast..... 2. R. SAMOENSIS
aa. Trees reaching 20 meters; inflorescence 10-to 50-flowered; floral buds ovoid, broadest near the middle, acute to obtuse at the tip; sepals at anthesis 8.0–8.5 mm. long; petals 6–7 mm. long; style 4.0–4.5 mm. long; bracteoles deltoid. Pacific coast..... 3. R. BREVISTYLA

1. RHIZOPHORA MANGLE L. Sp. Pl. 1:443. 1753.

Rhizophora americana Nutt. N. Amer. Sylv. 1:95. 1842.

Trees to 25 m. tall. Leaves obovate or elliptic, the apex obtuse, the base cuneate, slightly decurrent on the petiole, 7–15 cm. long, 2.0–8.5 cm. broad, glabrous, coriaceous; petiole 1.0–2.5 cm. long. Inflorescence once-dichotomous and 2-flowered, rarely trichotomous and 3-flowered; peduncles 1.5–3.5 cm. long; pedicels 0.5–2.0 cm. long; bracteoles truncate-trapezoid. Floral buds ampullaceous, broadest at the base, acuminate at the tip; sepals 11–15 mm. long, 4 mm. wide; petals involute, 9–11 mm. long, 2.0–2.5 mm. wide; stamens 8, 5.5–7.0 mm. long; ovary bilocular, half-inferior, the conical upper half terminating in a bifid style, the length of ovary from base of disc to tip of stigma 5–7 mm. Fruit 1.9–2.6 cm. long, 1.0–1.3 cm. wide, the protruding seedling up to 40 cm. long.

This species occurs along the Atlantic coast from Florida to Brazil and in the West Indies, and also occurs, though not so commonly, along the west coast of

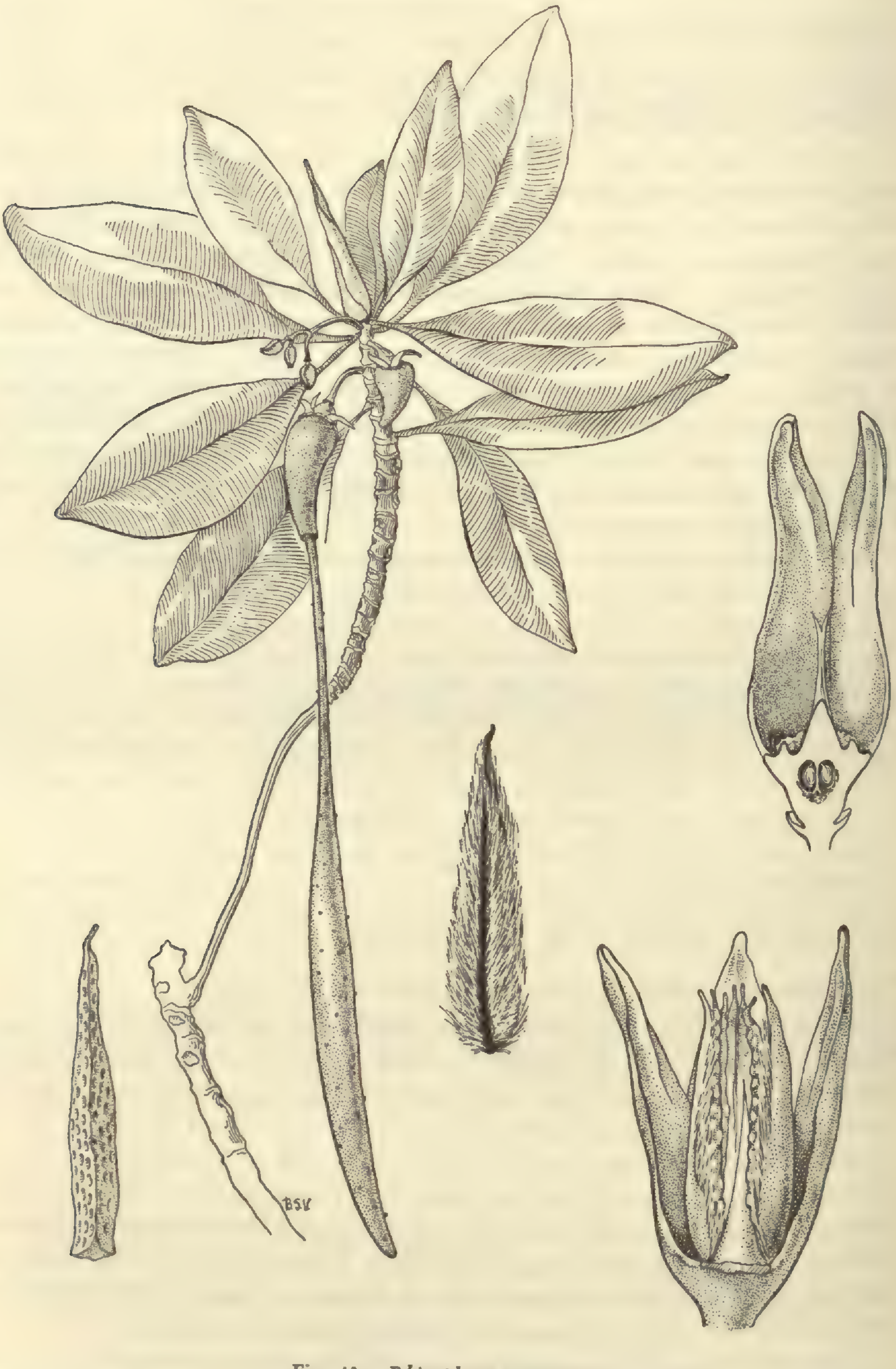

Fig. 43. *Rhizophora samoensis*

Africa. It grows only along the coast, either within the high tide zone or in lakes behind beaches or river estuaries in which it can become established. Under suitable conditions it forms dense stands in shallow water and apparently contributes to land building once it is established.

BOCAS DEL TORO: Nances Cay Island, *Von Wedel 577*; Water Valley, *Von Wedel 994*. CANAL ZONE: Cristóbal, *Salvoza 1010*; Manzanillo Island, *Hayes 46*. CHIRIQUÍ: vicinity of San Bartolomé, Peninsula de Burica, *Woodson & Schery 934*.

2. RHIZOPHORA SAMOENSIS (Hochr.) Salvoza, in Nat. and Appl. Sci. Bull. Philipp. 5:220. 1936.

Rhizophora mangle var. *samoensis* Hochr. in Candollea 2:447. 1925.

Shrubs to 5 m. tall. Leaves lanceolate, elliptic or ovate, the apex obtuse, the base cuneate, slightly decurrent on the petiole, 7.5–15.5 cm. long, 2.5–6.5 cm. broad, glabrous, coriaceous; petiole 0.5–2.5 cm. long. Inflorescence once or twice dichotomous and 2- to 4-flowered, rarely trichotomous and 3- to 6-flowered; primary peduncles 1.0–4.5 cm. long; pedicels 3–8 mm. long; bracteoles truncate-trapezoidal; sepals 8–10 mm. long, 3–4 mm. wide; petals involute, hairy at the margins, 5–8 mm. long, 1–2 mm. wide; stamens 8, 4.5–6.0 mm. long; ovary bilocular, half-inferior, the conical upper half terminating in a bifid style, length of ovary from base of disc to tip of stigma 3.5–4.0 mm.; disc fleshy, 1 mm. high. Fruit 1.5–2.5 cm. long, 1.0–1.5 cm. wide, the protruding seedling 25–35 cm. long.

This species occurs on the Pacific coast of Mexico, Central America, and South America from lower Baja California to Ecuador. It is also found on some of the Pacific islands. This plant is similar in size to the smaller form of *R. mangle* but, unlike *R. mangle* and *R. brevistyla*, it never grows to a large tree. Otherwise its ecology is probably similar to that of *R. mangle*, to which it seems closely related.

CANAL ZONE: Bella Vista, *Salvoza 1006*.

R. samoensis is very similar to *R. mangle* except for its smaller flowers, shorter style and constantly small habit and its distribution on the Pacific coast. The shape of the floral buds of this species is identical to that of *R. mangle* and the bracteoles are very similar. Although the floral buds of *R. samoensis* are of the same size as those of *R. brevistyla* they differ in shape, as do the bracteoles, and the inflorescence of *R. brevistyla* branches more and bears many more flowers.

The American plants seem to be identical with those from the Samoan Islands and since this species was first given nomenclatural recognition by Hochreutiner for Samoan material as a variety of *R. mangle*, the name *samoensis* is used. In Guppy's (Observations of a Naturalist in the Pacific II:449. 1906.) opinion this species is not fitted for oceanic dispersal from Central America into the Pacific, particularly because of likely damage to the exposed plumule. He postulates a former wide distribution of the species and subsequent diminution of range leaving the species in two widely separated areas, western America and the western Pacific islands.

3. RHIZOPHORA BREVISTYLA Salvoza, in Nat. and Appl. Sci. Bull. Philipp. 5:211. 1936.

Rhizophora racemosa Hieron. in Engl. Bot. Jahrb. 20:61. 1895, non Mey.

Trees to 20 m. tall. Leaves elliptic to broadly elliptic, the apex obtuse, the base cuneate, slightly decurrent on the petiole, 9.5–15.0 cm. long, 4.5–7.0 cm. broad, glabrous, coriaceous; petiole 1.5–2.0 cm. long. Inflorescence several times dichotomous with from 10–50 flowers; primary peduncles 1.5–3.5 cm. long; pedicels 0.3–1.0 cm. long; bracteoles deltoid. Floral buds ovoid, broadest near the middle, acute to obtuse at the tip; sepals 8.0–8.5 mm. long, 3.5–4.0 mm. wide; petals involute, 6–7 mm. long, 1.5 mm. wide; stamens 8, 5.5–6.0 mm. long. Ovary bilocular, half-inferior, the superior portion from the base of the disc to the tip of the bifid style 4.0–4.5 mm. long. Fruit 2.7–3.5 cm. long, 1.1–1.6 cm. broad, the protruding seedling 30–45 cm. long.

This species occurs on the Pacific coast from Panama to Ecuador. As described by I. M. Johnston (in Sargentia 8:222. 1949.) on San José Island, Panama, there are two types of growth form. The most common is a shrub reaching 6 meters in height, resembling *R. mangle* in general appearance and also resembling *R. samoensis* which grows with it in Panama and south along the Pacific coast. The other growth form is a tree reaching 20 meters in height. Johnston also points out the correlation between growth form and number of flowers per inflorescence in this species, the smaller plants having greatly reduced numbers of flowers, as few as 4–6 per inflorescence in the smallest ones.

CANAL ZONE: Bella Vista, *Salvoza 1007*; locality lacking, *Allen 1726*. PANAMÁ: San José Island, Pearl Archipelago, *Harlow 33*, *Johnston 253*, *1357*; Saboga Island, Pearl Islands, *Miller 1963*.

2. CASSIPOUREA Aubl.

CASSIPOUREA Aubl. Hist. Pl. Guian. 1:528. 1775.

Tita Scop. Introd. 219. 1777.
Legnotis Sw. Prod. 84. 1788.
Richaeia Thou. Gen. Nov. Madag. 25. 1806.
Richeia Poir. Encycl. Supp. 4:680. 1816.
Weihea Spreng. Syst. 2:594. 1825.
Anstrutheria Gardn. in Calc. Journ. Nat. Hist. 6:344. 1846.
Dactylopetalum Benth. in Journ. Linn. Soc. 3:79. 1858.
Richea O. Ktze. Rev. Gen. 235. 1891. non R. Br. 1810.

Trees or shrubs, with slim branchlets. Leaves opposite, coriaceous or membranaceous, simple, with caducous interpetiolar stipules. Flowers perfect and regular, solitary to fascicled in the axils of the upper leaves, bracteate, with articulated pedicels. Calyx coriaceous, 4- to 7-lobed, valvate, hairy or glabrous, campanulate to spreading. Petals unguiculate and often elaborately fimbriate or lacerate, inflexed, pubescent or glabrous. Stamens 8–40, inserted on or outside the disc, filaments equal to or longer than the calyx. Ovary 2- to 4-locular, hypogynous or slightly adnate to the base of the calyx, surrounded by a fleshy or

Fig. 44. *Cassipourea elliptica*

membranaceous disc, each locule with 2 pendulous ovules; style filiform or stout. Fruit a fleshy capsule, septifragal; seeds 2–4, arillate.

About 60 species of mountains, river banks and sandy shores; tropical America, Africa (where the species are most numerous), Ceylon and southern India.

1. CASSIPOUREA ELLIPTICA (Sw.) Poir. Dict. Suppl. 2:131. 1811.

Legnotis elliptica Sw. Prod. 84. 1788.
Cassipourea alba Griseb. in Götting. Abh. 7:223. 1857.
Cassipourea elliptica β alba Griseb. Fl. of B. W. Indies 274. 1860.
Cassipourea elliptica γ pauciserrata Griseb. loc. cit. 1860.
Cassipourea cubensis Urb. Symb. Antill. 7:293. 1912.
Cassipourea podantha Standl. in Field Mus. Bot. 4:241. 1929.
Cassipourea macrodonta Standl. loc. cit. 242. 1929.

Shrubs or trees to 17 m. tall. Leaves elliptic or ovate, the apex acuminate or acute, the base cuneate, 5–16 cm. long, 2.0–6.5 cm. wide, the upper half sometimes serrate, glabrous, coriaceous or membranaceous; petiole 3–10 mm. long; stipules 4–5 mm. long, appressed pilose dorsally, soon caducous. Flowers numerous, occasionally solitary; pedicels 2–5 mm. long, articulated just beneath the flower, minutely bracteate at the base, strigose to glabrous. Calyx fleshy, campanulate, to 5 mm. long, with 4–5 lobes 2 mm. long, often stipitate at the base, sericeous within. Petals 4–5, spatulate, laciniate, pilose to glabrous. Stamens 15–25, the slender filaments sometimes united at the base, inserted on the outside of the fleshy disc. Ovary 3-locular, sericeous above at the base of the style; style slender, 4–5 mm. long, sericeous at the base or nearly to the stigma; stigma capitate. Fruit ovoid, crowned by the persistent calyx.

This species is widespread in the West Indies and in Central America, growing along rivers, near beaches, and in forested areas.

BOCAS DEL TORO: Old Bank Island, vicinity of Chiriquí Lagoon, *Von Wedel 2128*; Little Bocas, vicinity of Chiriquí Lagoon, *Von Wedel 2490*; Fish Creek Mts., vicinity of Chiriquí Lagoon, *Von Wedel 2244*; Fish Creek, vicinity of Chiriquí Lagoon, *Von Wedel 2231*; region of Almirante, Daytonia Farm, *Cooper 446*; Water Valley, vicinity of Chiriquí Lagoon, *Von Wedel 1554, 1658, 1659*; Changuinola Valley, *Dunlap 447*; Bastimentos, Mariano Creek, vicinity of Chiriquí Lagoon, *Von Wedel 2897*; vicinity of Chiriquí Lagoon, *Von Wedel 1268, 1268A*; locality lacking, *Von Wedel 386*. CANAL ZONE: Manzanillo Island, *Hayes 51*; near Fort Randolph, *Standley 28640*; south of Fort Sherman, *Johnston 1767*; Barro Colorado Island, *Bangham 566, 416, Salvoza 840, 970, Wetmore & Abbe 161, Woodworth & Vestal 527*. CHIRIQUÍ: vicinity of San Félix, *Pittier 5741*. COLÓN: Chagres, *Fendler 191*. DARIÉN: vicinity of La Palma, *Pittier 5483, 6617*; Cana-Cuasi Trail, Real?, *Terry & Terry 1562*. PANAMÁ: San José Island, Perlas Archipelago, *Johnston 112, 114, 223, 340, 421, 558, Erlanson 65, 203, 390, 472, 514, Harlow 16*.

The leaves of this species are quite variable in both size and shape, segregated species having been named principally on local extreme leaf variation. Standley's *C. macrodonta* is such an extreme local variant, centered in the Changuinola Valley and around the Chiriquí Lagoon, its leaves being more membranaceous with a longer apex and often with longer teeth, but these characteristics are sometimes found singly in typical *C. elliptica* and are not correlated with differentiating floral characteristics. This plant is not clearly enough defined from *C. elliptica* to warrant specific rank. Standley's *C. podantha* is not even an extreme variant, and it cannot be distinguished from *C. elliptica*.

COMBRETACEAE

By A. W. EXELL

Trees, shrubs or lianas, rarely subherbaceous (never in Panama). Leaves opposite, verticillate, alternate or spiral, exstipulate, simple, almost always entire. Flowers perfect or perfect and staminate in the same inflorescence, usually actinomorphic, sometimes slightly zygomorphic, in axillary or extra-axillary, elongated or subcapitate spikes or racemes or in terminal and sometimes axillary panicles. Receptacle (hypanthium) usually in two distinct parts, the lower receptacle surrounding the ovary and adnate to it and the upper receptacle (calyx-tube) produced beyond it to form a short or long tube terminating in the (sometimes poorly developed) calyx-lobes, caducous or persistent. Calyx-lobes 4–5 (rarely 6–8 or almost obsolete) sometimes accrescent (not in Panama genera). Petals 4–5 or absent, conspicuous or very small. Stamens usually twice as many as the sepals or petals, borne inside the upper receptacle, usually in two series, exserted or included, anthers versatile or more rarely adnate to the filaments and immobile. Disk usually present, often hairy, intrastaminal. Style free in American genera (partly attached to the upper receptacle in *Quisqualis*). Ovary completely inferior in all American genera (semi-inferior in the West African genus *Strephonema*), unilocular, with usually 2 (sometimes up to about 6) pendulous ovules of which only one usually develops. Fruit (pseudocarp) very variable in size and shape, fleshy or dry, usually indehiscent, often variously winged or ridged, 1-seeded.

The Combretaceae, an entirely tropical and subtropical family, found in rain-forest, deciduous forest, savanna and mangrove formations, comprise 18 genera of which two, *Combretum* and *Terminalia*, contain the great majority of species. Some species of *Terminalia* yield useful timber and the 'myrobalans' used for dyeing in Asia. A few species of *Combretum* are cultivated in the tropics and as stove-plants in temperate countries. *Terminalia catappa* L., a native of tropical Asia and Polynesia, is often planted in towns as an avenue tree and *Quisqualis indica* L., the Rangoon Creeper, is a climber often grown in tropical gardens.

In the course of their evolution the Combretaceae seem to have developed under the influence of two principal tendencies: (1) the attraction of pollinating insects by the massing of relatively small flowers in dense or rather dense inflorescences, though with a number in individual exceptions (such as *Combretum cacoucia*); (2) dispersal of the fruits by means of laterally extended wings (again with numerous exceptions). The progressive development of inflorescences and fruits along these lines leads to obvious space difficulties as the more the flowers are crowded into pseudo-capitate spikes the less room there is for the development of wings to the fruits. Several of the genera recognized in the family represent different solutions to this problem. In Panama we have one of the most 'advanced' solutions in the genus *Conocarpus* where the flattened pseudocarps, perhaps after a secondary reduction in the wings, are tightly packed into a cone-like aggregate fruit. The fact that isolated species of *Combretum*, belonging to quite different sections, have

wingless or nearly wingless fruits, often distributed by water, may also indicate that wingless fruits have developed from winged ones.

In the various forms which the winging of the fruit may take we have an interesting combination of two factors. From the inferior ovary, probably originating from a single carpel, embedded in receptacular tissue, there is apparently what we might call an 'internal' tendency to produce a 2-winged fruit resulting from the bilateral symmetry of the carpel. From the 4-merous or 5-merous calyx, on the other hand, there seems to be an 'external' tendency to produce a 4-winged (*Combretum*) or 5-winged (*Combretum* and *Terminalia*) fruit. In *Terminalia*, in particular, it is interesting to see the effect of these two tendencies. We find, for example, in addition to numerous species with either 2-winged or 5-winged fruits respectively, certain species, such as *T. amazonia* in Panama, with primarily 2-winged fruits in which three secondary wings or ridges are also developed. If this interpretation is correct it would seem that the great plasticity in the winging of the fruit is due to the surrounding, in an inferior fruit, of a bilateral 'core' by a 4-merous or 5-merous 'skin'.

a. Receptacle (hypanthium) without adnate bracteoles; petals present or absent.
  b. Petals present (in Panama species) ..... 1. COMBRETUM
bb. Petals absent.
  c. Fruits solitary, not closely aggregated.
    d. Anthers versatile.
      e. Calyx-lobes triangular; upper receptacle and calyx caducous (in Panama species) before the fruit ripens ..... 2. TERMINALIA
      ee. Calyx only slightly toothed; upper receptacle and calyx persistent on the fruit or only tardily dehiscent ..... 3. BUCIDA
    dd. Anthers adnate to the filaments, immobile ..... 4. BUCHENAVIA
  cc. Fruits aggregated into a cone-like structure ..... 5. CONOCARPUS
aa. Receptacle (hypanthium) with two small adnate bracteoles near the apex; petals present ..... 6. LAGUNCULARIA

The introduced genus *Quisqualis* (receptacle without adnate bracteoles; petals present) is separated from *Combretum* by the adnation of the style for part of its length to the wall of the upper receptacle (calyx-tube). The species cultivated, *Q. indica*, can at once be distinguished from all the indigenous Combretaceae by its much elongated, narrowly infundibuliform upper receptacle (calyx-tube), up to 8 cm. long when the flowers are fully developed.

1. COMBRETUM Loefl.

COMBRETUM Loefl. Iter. Hispan. 308. 1758, nom. conserv.

Grislea L. Sp. Pl. 348. 1753; Gen. Pl. 164. 1754.
Aetia Adans. Fam. 2:84, 513. 1763.
Cacoucia Aubl. Pl. Guian. 1:450. *t. 179.* 1775.
Hambergera Scop. Introd. Hist. Nat. 106. 1777.
Cristaria Sonner. Voy. Ind. Orient. 2:247. *t. 140.* 1782.
Hambergia Neck. Elem. Bot. 141. 1790.
Schousboea Willd. in L. Sp. Pl. 2:578. 1799.
Poivrea Comm. [ex Juss. Gen. Pl. 320. 1789, in syn. (sphalm. "*Pevraea*")] ex Thou., Obs. Pl. Il. Austr. Afr. 28. 1811.
Gonocarpus Ham. Prodr. Pl. Ind. Occ. 39. 1825.
Forsgardia Vell. Fl. Flum. 4:152. 1825; *t. 13.* 1835.

Chrysostachys Pohl, Fl. Bras. 2:65. *t. 143.* 1831.
Sheadendron Bertol. f. in Mem. Acad. Bologn. 2:574. *t. 4.* 1850.
Embryogonia Bl. Mus. Lugd. Bat. 2:122. 1852.
Bureava Baill. in Adans. 1:171. 1860–61.
Seguiera Reichb. ex Oliv. Fl. Trop. Afr. 2:424. 1871 in syn., non Adans. (1763).
Campylochiton Welw. ex Hiern, Cat. Afr. Pl. Welw. 2:353. 1898.

Trees, shrubs or woody climbers, very rarely subherbaceous. Leaves opposite, verticillate or more rarely alternate, usually petiolate, almost always entire, often conspicuously lepidote. Petioles sometimes persisting after leaf-fall, forming thorns. Flowers usually perfect, actinomorphic or rarely slightly zygomorphic, in elongated or subcapitate, axillary or extra-axillary spikes or racemes or in terminal or terminal and axillary, often leafy panicles. Receptacle usually clearly divided into a lower part (lower receptacle) surrounding and adnate to the ovary and an upper part (upper receptacle) varying from patelliform to elongate-infundibuliform terminating in the calyx-lobes. Upper receptacle often further differentiated into a lower part containing the disk and a usually more expanded upper part. Calyx-lobes usually 4 or 5 (rarely more) deltoid to filiform or sometimes scarcely developed. Petals usually 4 or 5 (very rarely absent but never in Panama species except perhaps by abortion) small and inconspicuous or showy and exceeding the calyx-lobes, white, yellow, orange, red or purple, glabrous or hairy, occasionally scaly. Stamens usually twice as many as the petals, inserted inside the upper receptacle, often biseriate, usually exserted; anthers dorsifixed, versatile. Disk intrastaminal, glabrous or hairy, sometimes very small or absent. Ovary completely inferior, probably of 1 carpel, unilocular with usually 2 (occasionally up to 6) pendulous ovules of which only 1 develops. Style simple, free, usually exserted, rarely very short. Fruit (pseudocarp) 4- to 5-winged, -ridged or -angled, sessile or stipitate, usually indehiscent, 1-seeded; pericarp usually thin and papery, sometimes leathery, more rarely fleshy.

About 250 species throughout the tropics (except Australia); extending in the New World from Mexico to Argentina.

The Panama species are classified as follows:

A. Sect. Eucombretum Don.: *C. fruticosum* (Loefl.) Stuntz; *C. sambuense* Pittier
B. Sect. Cacoucia (Aubl.) Engl. & Diels.: *C. cacoucia* Exell.
C. Sect. Combretastrum Eichl.: *C. laxum* Jacq.
D. Sect. Spinosae Exell.: *C. decandrum* Jacq.; *C. spinosum* Bonpl.

a. Flowers tetramerous.
  b. Flowers measuring at least 7 mm. from the rhachis to the tips of the calyx-lobes, conspicuously scaly; disk well developed, margin pilose.
    c. Scales of inflorescence usually golden-brown (in dried specimens). Petals rarely more than 1.5 mm. long..... 1. C. fruticosum
    cc. Scales of inflorescence red (in dried specimens). Petals 4–5 mm. long..... 2. C. sambuense
  bb. Flowers much smaller, less than 5 mm. from the rhachis to the tips of the calyx-lobes, not conspicuously scaly, in terminal panicles; disk inconspicuous, glabrous..... 4. C. laxum
aa. Flowers pentamerous.
  b. Flowers actinomorphic, small, measuring less than 5 mm. from the rhachis to the tips of the calyx-lobes. Fruit broadly winged.

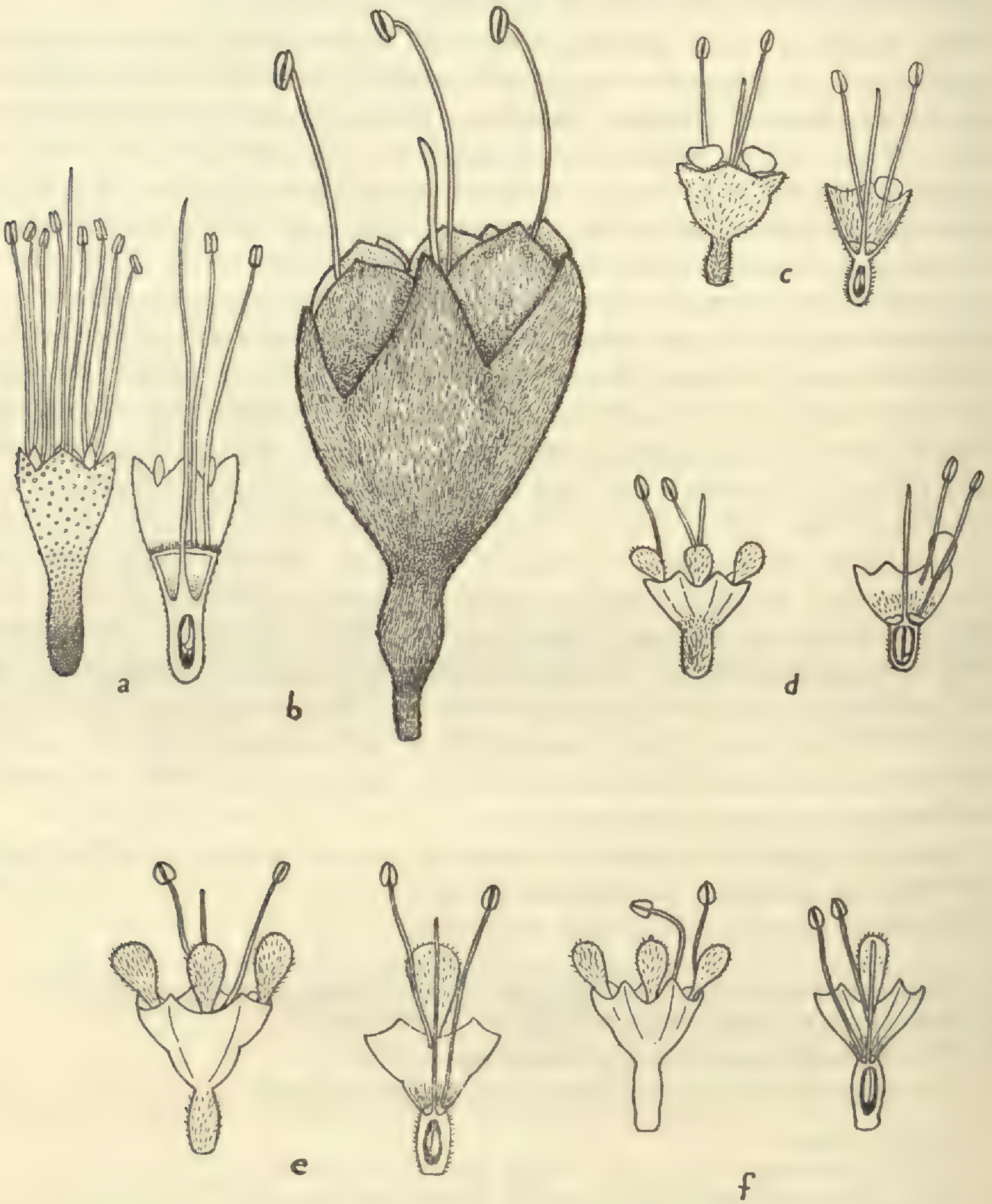

Fig. 45. *Combretum*: Diagrams of Flower Structure. (a) *C. fruticosum*; (b) *C. cacoucia*; (c) *C. laxum*; (d) *C. spinosum*; (e) & (f) *C. decandrum*. By courtesy of Linnean Society of London.

c. Lower receptacle, nearly glabrous or patent-pubescent, slightly pedicellate and narrowed at the apex..... 5. C. DECANDRUM
cc. Lower receptacle appressed-pubescent, sessile, scarcely narrowed at the apex..... 6. C. SPINOSUM
bb. Flowers slightly zygomorphic, relatively large, up to 3 cm. from the rhachis to the tips of the calyx-lobes. Fruit narrowly winged or ridged..... 3. C. CACOUCIA

1. COMBRETUM FRUTICOSUM (Loefl.) Stuntz, in U. S. Dept. Agric. Bur. Pl. Ind. Seeds & Pl. Import. no. 31:86. 1914.

Gaura fruticosa Loefl. Iter. Hispan. 248. 1758.
Combretum occidentale L. Syst. Nat. 2:999. 1759, nom. illegit.
Combretum secundum Jacq. Enum. Syst. Pl. Ins. Carib. 19. 1760.
Combretum laxum sensu L. Sp. Pl. 1:496. 1762, pro parte, non Jacq.
Combretum formosum Don, in Trans. Linn. Soc. Lond. 15:420. 1827.
Combretum micropetalum DC. Prodr. 3:19. 1828.
Combretum aurantiacum Benth. in Hook. Lond. Journ. Bot. 2:222. 1840.
Combretum loeflingii Eichl. in Mart. Fl. Bras. 14^2:110. 1867, nom. illegit.
Combretum warszewiczianum Eichl. loc. cit. 1867.
Combretum benthamianum Heurck & Müll. Arg. Obs. Bot. 220. 1870.
Combretum gloriosum Rusby, in Mem. Torr. Bot. Club 6:35. 1896.
Combretum farinosum var. *phaenopetalum* J. D. Sm. in Bot. Gaz. 23:7. 1897.
Combretum superbum Pittier, in Contrib. U. S. Nat. Herb. 18:242. 1917.
Combretum phaenopetalum (J. D. Sm.) Pittier, loc. cit. 243. 1917.
Combretum lepidopetalum Pittier, loc. cit. 245. 1917.
Combretum multidiscum Rusby, Descr. New Sp. S. Amer. Pl. 69. 1920.
Combretum loeflingii subsp. *ornithophilum* Suesseng. in Mitteil. Bot. Staatssamml. Münch. 14. 1950.

For an explanation of some complicated points in the synonymy see Exell, in Journ. Linn. Soc. Lond. 55:117. 1953.

Shrub of 3–8 m. or liana, branchlets somewhat quadrangular, scaly at first but otherwise glabrous (in Panama specimens). Leaves papyraceous or chartaceous, opposite, petiolate; petioles scaly, 7–10 mm. long; lamina elliptic to broadly elliptic, 5–12 × 3–7 cm., minutely verruculose above, conspicuously scaly beneath, scales usually golden or golden-brown, occasionally reddish, dense but scarcely marginally contiguous, usually glabrous or nearly so in Panama but variously hairy in other regions, rather bluntly acuminate at the apex, cuneate or rounded at the base. Flowers yellow or greenish-yellow, 4-merous, sessile or subsessile in terminal panicles of spikes and lateral spikes, rhachis scaly. Lower receptacle (ovary) quadrangular, 2–3 mm. long, densely scaly; upper receptacle clearly differentiated into two parts, a lower narrowly infundibuliform part containing the disk and an upper broadly infundibuliform or campanulate part terminating in the calyx-lobes, measuring about 7–8 mm. from the apex of the ovary to the tips of the calyx-lobes, with conspicuous golden or golden-brown (rarely reddish) scales otherwise nearly glabrous (in Panama). Calyx-lobes broadly ovate, about 2 mm. long. Petals yellow, usually glabrous, very variable in size and shape but usually not more than 1–1.5 mm. long, shorter than the calyx-lobes. Stamens 8, filaments 15–20 mm. long, anthers about 1 mm. long. Disk infundibuliform with a pilose margin. Style 15–20 mm. long, glabrous. Fruit subspherical in outline, 14–18 mm. in diameter, reddish-brown or purple, with 4 flexible wings about 6 mm. wide, scaly, shortly stipitate.

Fig. 46. *Combretum fruticosum*

Widespread in the New World from Mexico to Argentina.

For an account of the variability of this species see Exell, in Journ. Linn. Soc. Lond. 55:121. *fig. 3.* 1953.

Specimens of this species, as here delimited, have often been named *C. farinosum* Kunth, a species which, in my opinion, extends only from Mexico to Costa Rica. It is not easy to give cenventional key characters to separate these two species, especially in view of the wide range of variation I have included in *C. fruticosum*. Unfortunately I have never had the opportunity of examining living specimens, but really well-preserved herbarium specimens of the two species are quite different in appearance. In *C. farinosum* the flowers (receptacles) look silvery-grey, the petals dry red or dark red, the golden or reddish filaments make a considerable contrast in color with the receptacle and the dried anthers are about 1.5 mm. long. In *C. fruticosum* the inflorescences of modern, carefully prepared specimens are of a greenish golden-brown color (reddish in older specimens), the petals dry yellow and the dried anthers do not exceed 1 mm. in length.

It is possible to have a merry time making 'species' out of this complex for there is an extraordinary range of variation in the petals and in the indumentum. Add to this a number of ancient nomenclatural tangles and it is easily understandable how this species became so richly endowed with synonyms.

COCLÉ: between Aguadulce and Río Chico, *Pittier 5006*; near Penonomé, *Williams 72*. CANAL ZONE: near Cristóbal, Colón, *Broadway 162, 589*; near Salamanca Hydrographic Station, alt. 70–80 m., *Dodge, Steyermark & Allen 17981*; Río Grande, *Hayes 446*; Punta Paitillo, *Heriberto 214*; between Empire and Mandinga, *Piper 5489*; near Culebra, *Pittier 2158*; near Fort Sherman, *Standley 31016*; near Miraflores, *P. & G. White 50*. PANAMÁ: near San Carlos, alt. 0–10 m., *Allen 1142*; Bejuco, *Allen 2888*; near Bejuco, *Dodge, Hunter, Steyermark & Allen 16730*; near Panamá, *Hayes 446*; Perlas Archipelago, San José Island, *Johnston 908*; near Panamá, *Sargent 10*; Bella Vista, *Standley 25308*; Corozal Road, near Panamá, *Standley 28081*. HERRERA: near Ocú, alt. 100 m., *Allen 4052*. VERAGUAS: hills west of Soná, alt. c. 500 m., *Allen 1065*. PROVINCE UNKNOWN: *Duchassaing s. n.*; *Halsted s. n.*; *Hayes 308*; *Killip 3295*; *Seemann s. n.*

The specimen collected by P. & G. White, at Miraflores, is noted as being a 'large tree'. This may be an error.

2. COMBRETUM SAMBUENSE Pittier, in Contrib. U. S. Nat. Herb. 18:242. 1917.

Woody liana, branchlets glabrous, slightly quadrangular. Leaves chartaceous to subcoriaceous, opposite, petiolate; petiole 5–10 mm. long, scaly; lamina ovate to broadly elliptic, 11–18 × 5.5–9.5 cm., glabrous, minutely verruculose above with conspicuous golden-yellow scales beneath, scales rarely marginally contiguous, usually acuminate at the apex and rounded at the base. Flowers reddish or purplish, 4-merous, sessile, in terminal panicles of spikes and lateral axillary spikes, rhachis densely rufous-scaly. Lower receptacle (ovary) quadrangular, 5 mm. long, densely rufous-scaly; upper receptacle fleshy, broadly infundibuliform, slightly narrowed towards the base, measuring about 10 mm. to the tips of the calyx-lobes, densely rufous-scaly outside, villous within. Calyx-lobes ovate, 4–5 mm. long. Petals 4, yellow, broadly elliptic, acute, 4–5 mm. long, glabrous, slightly shorter than the calyx-lobes. Stamens 8, inserted at the margin of the disk, filaments 25–35 mm.

long, anthers 2 mm. long. Disk infundibuliform, pilose at the margin. Style 35–40 mm. long, glabrous. Fruit crimson, suborbicular, 1.8–2.5 cm. in diameter, scaly and minutely pubescent.

DARIÉN: near Pinogana, alt. 20 m., *Allen 4275*; Río Sambú, *Pittier 5548*; Tuculi, Chepigana, alt. 16 m., *Terry & Terry 1375*.

3. COMBRETUM CACOUCIA Exell, apud Sandw. in Bull. Misc. Inf. Kew, 1931:469. 1931.

Cacoucia coccinea Aubl. Pl. Guian. 1:450. *t. 179*. 1775.
Schousboea coccinea (Aubl.) Willd. in L. Sp. Pl. 2:578. 1779.
Terminalia cacoucia Baill. Hist. Pl. 6:275. 1877, nom. illegit.
Combretum coccineum (Aubl.) Engl. & Diels, in Engl. Mon. Afr. Pflanz. -Fam. & -Gatt. 3:110. 1899, nom. illegit., non Lam. (1785).

Shrub or liana, branchlets rufous-pilose. Leaves chartaceous, opposite, petiolate, petiole 5–8 mm. long, pilose, lamina broadly elliptic to oblong-elliptic, up to 20 × 10 cm., often pilosulose or pubescent on the midrib and principal nerves beneath, otherwise glabrous or nearly so, not conspicuously lepidote, acuminate at the apex and subcordate at the base, lateral nerves 7–8 pairs rather widely spaced. Flowers red, 5-merous, slightly zygomorphic, shortly pedicellate, pedicel 3–5 mm. long tomentellous, in stout terminal racemes up to 40 cm. long, rhachis tomentellous or velutinous, bracts ovate-acuminate or lanceolate, up to 15 mm. long, caducous. Lower receptacle (ovary) tomentellous, about 5 × 2.5 mm.; upper receptacle (calyx-tube) campanulate or broadly infundibuliform, slightly curved, up to 15 × 11 mm., sericeous outside. Calyx-lobes triangular, up to 5 mm. long. Petals 5, ovate or elliptic, mucronate, 10 × 7 mm., minutely pubescent on the outside or nearly glabrous. Stamens 10, exserted, filaments about 20 mm. long, anthers 1.2–1.5 mm. long. Disk well-developed with margin produced into an annular ridge which nearly closes the upper receptacle. Style 25 mm. long, glabrous. Fruit narrowly oblong-ellipsoid, longitudinally 5-ridged, up to 6 × 2 cm., velutinous at first, eventually nearly glabrous.

British Honduras to Brazil.

BOCAS DEL TORO: Water Valley, *Von Wedel 1628, 1902*; Old Bank Island, *Von Wedel 1979*; Fish Creek lowlands, *Von Wedel 2373*. CANAL ZONE: Majunga Swamp, neighborhood of Río Chagres, *Allen 854*; Gatún, *Hayes 8, s. n.*; Lion Hill Station, *Hayes 541*; Gatún, *Heriberto 110*; Río Chagres, below Gatún, *Maxon 4798*; Frijoles, *Pittier 2692*. COLÓN: Camp Piña, 0–50 m., *Allen 3432*; Río Culebra, above Sta. Isabel, *Pittier 4169*.

For a discussion of the significance of the geographical distribution of *Combretum* Sect. CACOUCIA, to which this species belongs, see Exell, in Journ. Linn. Soc. Lond. 55:104. 1953.

4. COMBRETUM LAXUM Jacq. Enum. Pl. Carib. 19. 1760.

Combretum puberum Rich. in Act. Soc. Hist. Nat. Par. 1:108. 1792.
Combretum obtusifolium Rich. loc. cit. 1792.
Combretum mexicanum Bonpl. Pl. Aequinox. 2:159. *t. 132*. 1809.
Forsgardia laevis Vell. Fl. Flum. 152. 1825.
Combretum odoratum Pav. ex Don, in Trans. Linn. Soc. Lond. 15:430. 1827.
Combretum cordatum Don, loc. cit. 440. 1827.
Combretum ferrugineum Don, loc. cit. 1827.

Combretum bugi Cambess. in St.-Hil. Juss. & Cambess., Fl. Bras. Merid. 2:247. *t. 130.* 1829.
Chrysostachys ovatifolia Pohl, Pl. Bras. 2:66. *t. 143.* 1831.
Combretum variabile Mart. in Flora 22, Beibl. 1:62. 1839.
Combretum pulchellum Mart. loc. cit. 64. 1839.
Combretum ferrugineum Hoffmansegg, ex Mart. loc. cit. 1839.
Combretum adenophyllum Mart. in Flora 24, Beibl. 2:1. 1841.
Combretum terminalioides Steud. in Flora 26^2:762. 1843.
Combretum jacquinii Griseb. Fl. Brit. W. Ind. 275. 1860, nom. illegit.
Combretum viscidum Wright, ex Griseb. Cat. Pl. Cub. 109. 1866.
Combretum accedens Heurck & Muell. Arg. in Heurck. Obs. Bot. 234. 1870.
Combretum odoratissimum Sessé & Moc. Fl. Mex. 90. 1894.
Combretum epiphyticum Pittier, in Contrib. U. S. Nat. Herb. 18:247. 1917.
Combretum oblongifolium Rusby, Descr. New Sp. S. Amer. Pl. 70. 1920.
Combretum marchii Fawc. & Rendle, in Journ. Bot. 63:115. 1925.
Combretum brunnescens Gleason, in Bull. Torrey Bot. Club 53:291. 1926.

The infra-specific taxa have been omitted. They are cited by Exell, in Journ. Linn. Soc. Lond. Bot. 55:127. 1953.

Liana (sometimes a shrub ?), branchlets rufous- or tawny-tomentose to almost glabrous. Leaves chartaceous to subcoriaceous, opposite, petiolate, petioles 2–7 mm. long, tomentose to almost glabrous, lamina oblong or oblong-elliptic to broadly ovate or suborbicular, 6–18 × 3–7 cm., not conspicuously scaly, varying from tomentose to nearly glabrous, usually acuminate sometimes subcaudate at the apex, rounded or subcordate at the base. Flowers white or yellow, small, fragrant, sessile, 4-merous, in terminal or terminal and axillary panicles, rhachis rufous- or fulvous-tomentose, tomentellous or pubescent. Lower receptacle 1–1.5 mm. long, tomentose, tomentellous, pubescent or nearly glabrous; upper receptacle cupuliform, 1–2 × 1.5–2.5 mm., densely pubescent to nearly glabrous. Calyx-lobes deltoid, about 0.7 mm. long. Petals 4, broadly obovate to transversely elliptic or subreniform, about 1 mm. in diam., glabrous, exceeding the calyx-lobes. Stamens 8, filaments about 4 mm. long, anthers 0.5 mm. long. Disk small, glabrous. Style 2.5–4 mm. long. Fruit oblong, narrowly ovoid or suborbicular, 4-ridged or -winged, 2.4 × 1.5–2 cm., pubescent or glabrous.

Widespread in the tropics and subtropics of the New World from Mexico to northern Argentina.

CANAL ZONE: Quebrada Tranquilla, alt. 70–80 m., *Dodge & Allen 17501*; near Gatún, *Hayes 7, s. n.*; Frijoles, *Hayes 54, s. n.*; Cano Quebrado, *Pittier 6668, 6819*; Río Chagres, *Steyermark & Allen 16774*. PROVINCE UNKNOWN: *Hayes 771*; *Seemann 1658*.

As in the preceding species a very broad view has been taken here. Those who wish for a narrower delimitation of the species will find names available in the synonymy for at least many of the taxa they may wish to recognize. In Panama, *Dodge & Allen 17501*, *Seemann 1658* and *Steyermark & Allen 16774* on the one hand and *Hayes 54* on the other represent extremes of variation and could be separated specifically with the greatest of ease. The three former specimens, in the event of such segregation, would seem to agree well with the Mexican material of *C. mexicanum* Bonpl. It is only when the species is studied over the whole hemisphere, especially with regard to the extraordinary range of variation in Brazil,

that the problem arises. The present conception of the species is, however, more a temporary convenience than a final solution. It is necessary to have far more fruiting material, at present very poorly represented in the herbaria. Included in the 'species', in its present conception are both narrowly angled and quite broadly winged fruits. If these differences could be correlated in any way with differences of leaf-shape and indumentum we should be on the way towards a more satisfactory system. Judging from what occurs in other species of *Combretum* and *Terminalia* in other parts of the world, one would expect to find ridged and angled fruits in flooded regions, along river-banks, etc. where distribution is by water, while species with broad-winged fruits are found in hill-slope and mountain forests, savannas etc. Field observations are badly needed.

5. COMBRETUM DECANDRUM Jacq. Enum. Pl. Carib. 19. 1760.

Combretum alternifolium Pers. Syn. 1:412. 1805, nom. illegit.
Gonocarpus jacquinii Hamilt. Prodr. Fl. Ind. Occ. 39. 1825, nom. illegit.
Poivrea alternifolia (Pers.) DC. Prodr. 3:17. 1828, nom. illegit.
Combretum palmeri Rose, in Contrib. U. S. Nat. Herb. 5:136. 1897.
Combretum nicoyanum Pittier, loc. cit. 18:247. 1917.
Combretum latepaniculatum Rusby, Descr. New Sp. S. Amer. Pl. 69. 1920.

Liana, branchlets pubescent or glabrous, spiny. Leaves alternate or sometimes subopposite, papyraceous, petiolate, petiole 2–5 mm. long, pubescent to tomentose, persistent and somewhat accrescent forming a spine, lamina elliptic to broadly elliptic, 5–14 × 3–7.5 cm., pubescent, especially on the nerves beneath, or nearly glabrous, often with hairy domatia in the axils of the nerves beneath, bluntly acuminate at the apex, blunt, rounded or subcordate at the base. Flowers white, subsessile or shortly pedicellate, 5-merous, in large terminal panicles, often with reduced leaves at the points of branching, rhachis tomentose, pubescent or glabrous. Lower receptacle about 1 mm. long, glabrous, nearly glabrous or loosely patent-pubescent, usually somewhat constricted at the apex and often with a short pedicel up to about 0.5 mm. long; upper receptacle campanulate to cupuliform, 2.5–3 × 1.5–2 mm., glabrous. Calyx-lobes 5, broadly deltoid, about 0.5 mm. long. Petals 5, obovate or obovate-elliptic, 2–3 × 1.5–1 mm., hairy. Stamens 10, filaments 3–5 mm. long, anthers 0.4 mm. long. Disk small, fleshy, glabrous, surrounding the base of the style. Style about 4 mm. long. Fruit suborbicular in outline, 1.5 cm. in diam., usually glabrous, 5-winged, wings thin, flexible, 5–6 mm. broad.

From Mexico to Colombia.

CANAL ZONE: Victoria Fill, near Miraflores Locks, *Allen 1746*; Empire Station, *Hayes 31*; near Gorgas Memorial Laboratory, *P. White 82*. DARIÉN: Patino, *Pittier 6607*.

6. COMBRETUM SPINOSUM Bonpl. Pl. Aequinox. 2:161. 1809.

Combretum guayca Humb. Rel. Hist. 3:3. 1825, nom. nud.
Poivrea eriopetalum DC. Prodr. 3:18. 1828.
Combretum eriopetalum (DC.) Don Gen. Syst. 2:665. 1832.
Combretum punctulatum Pittier, in Contrib. U. S. Nat. Herb. 18:248. 1917.

This differs from the preceding species only in having slightly smaller sessile flowers with the lower receptacle (ovary) appressed-pubescent and scarcely con-

stricted at the apex. One specimen, from Venezuela, with 4-merous flowers has been seen.

Panama, Venezuela and in the West Indies from Cuba to Trinidad.

CANAL ZONE: Río Trinidad, *Pittier 4002*.

It may prove necessary to unite this with *C. decandrum* when more material becomes available. *Allen 1746*, placed under *C. decandrum*, which I have now seen for the first time, has some appressed pubescence on the lower receptacle though it agrees in other respects with *C. decandrum*. The distribution areas of the two species, if such they be, overlap in Panama and there may well have been some hybridization.

2. TERMINALIA L.

TERMINALIA L. Syst. Nat. 2:674 (err. 638). 1767; Mant. Pl. 21. 1767, nom. conserv.

Adamaram Adans. Fam. 2:445. 1763, proparte excl. Hort. Malab. 4: *t. 5*. 1682.
Panel Adans. loc. cit. 447. 1763, pro parte quoad Hort. Malab. 4: *t. 10*. 1682.
Myrobalanifera Houtt. Handleid. Pl. Kruidk. 2:485. *t. 10, fig. 2*. 1774.
Tanibouca Aubl. Pl. Guian. 1:448. *t. 178*. 1775.
Pamea Aubl. loc. cit. 2:946. *t. 359*. 1775.
Kniphofia Scop. Introd. Hist. Nat. 327. 1777.
Aristotelia Comm. ex Lam. Dict. Encycl. Bot. 1:349. 1783.
Resinaria Comm. ex Lam., loc. cit. 1783.
Chuncoa Pav. ex Juss. Gen. Pl. 76. 1789.
Badamia Gaertn. Fruct. 2:90. *t. 97, fig. 1*. 1791.
Myrobalanus Gaertn. loc. cit. *fig. 2*. 1791.
Catappa Gaertn. loc. cit. 206. *t. 127*. 1791.
Gimbernatea Ruiz & Pav. Prodr. 138. *t. 36*. 1794.
Fatraea Juss. in Ann. Mus. Par. 5:223. 1804.
Pentaptera Roxb. [Hort. Beng. 34. 1814 nom. nud.] Fl. Ind. 2:437. 1832.
Vicentia Allem. Pl. Nov. Bras. *cum tab*. 1844.
Chichharronia A. Rich. Ess. Fl. Cub. 529. *t. 43*. 1845.

Trees, sometimes of great stature, frequently buttressed, rarely shrubs, branching often sympodial. Leaves usually spirally arranged, often crowded in pseudo-whorls at the ends of the branchlets, usually petiolate, entire, often minutely verruculose and pellucid-punctate, often with domatia, frequently with two or more glands at or near the base of the lamina or on the petiole. Flowers actinomorphic, 5-merous (rarely 4-merous) usually in axillary spikes with staminate flowers towards the apex and perfect flowers towards the base of the spike, or all perfect, more rarely in terminal or terminal and axillary panicles; staminate flowers stalked, stalks resembling pedicels but equivalent to the lower receptacle with abortion of the ovary; perfect sessile. Receptacle divided into a lower part (lower receptacle) enclosing and adnate to the ovary and often narrowed above it, and an upper part, often scarcely developed, expanded into a shallow cup terminating in the calyx-lobes. Calyx-lobes deltoid, ovate or triangular. Petals absent. Stamens usually 10, exserted; anthers dorsifixed, versatile. Disk intra-staminal, usually pilose or barbate, sometimes glabrous or poorly developed. Style simple, free, exserted. Ovary completely inferior, unilocular with 2 (rarely 3–4) pendulous

Fig. 47. *Terminalia chiriquensis*

ovules of which only one develops. Fruit (pseudocarp) very variable in size and shape, often fleshy and drupe-like, sometimes dry and leathery or corky, often 2- to 5-winged, usually with the endocarp at least partially sclerenchymatous (thus distinguishing it from *Combretum*).

About 200 species throughout the tropics.

In addition to the two species listed below, *T. catappa* L., an Asiatic and Polynesian species with large obovate leaves and drupaceous fruits, is commonly planted.

a. Leaves obovate and abruptly acuminate. Fruit 5-winged, two wings transversely elongated and much longer than the others..... 1. T. AMAZONIA
aa. Leaves elliptic. Fruit with 2 broad lateral and 1 inconspicuous carinate adaxial wings..... 2. T. CHIRIQUENSIS

1. TERMINALIA AMAZONIA (J. F. Gmel.) Exell, in Pulle, Fl. Surin. 3:173. 1935.

Chuncoa amazonia J. F. Gmel. in L. Syst. Nat. 2:702. 1791.
Gimbernatea obovata Ruiz & Pav. Fl. Peruv. Chil. Prodr. 138. 1794.
Chunchoa obovata (Ruiz & Pav.) Pers. Syn. 1:486. 1805.
Chuncoa obovata (Ruiz & Pav.) Poir. in Encycl. Méth. Bot., Suppl. 2:258. 1811.
Terminalia obovata (Ruiz & Pav.) Steud. Nomencl. Bot. 2:668. 1841, non *T. obovata* Cambess. (1829).
Terminalia odontoptera Heurck & Müll. Arg. Obs. Bot. 217. 1870.
Myrobalanus obovatus (Ruiz & Pav.) O. Kuntze, Rev. Gen. 237. 1891.
Terminalia hayesii Pittier, in Contrib. U. S. Nat. Herb. 18:239. 1917.

Large tree up to 30 m. high with buttresses and sympodial branching. Branchlets rufous-pilose or rufous-sericeous, soon glabrescent. Leaves chartaceous to subcoriaceous, spirally arranged in pseudo-verticels at the ends of the branchlets, petiolate, petiole 1–10 mm. long, rufous-pubescent, lamina obovate or cuneate, abruptly acuminate at the apex, cuneate at the base usually with two glands, 5–10 × 3.5 cm., usually rather sparsely appressed-pubescent or appressed-pilose with hairy domatia in the axils of the principal veins beneath. Flowers white, cream or yellowish-green, apparently all perfect, 5-merous, sessile, in axillary spikes 6–7 cm. long, rhachis tomentellous. Lower receptacle 2–2.5 mm. long, sericeous; upper receptacle shallow-cupuliform, 0.8 × 2 mm., appressed-pubescent. Calyx-lobes deltoid, 0.8 mm. long, usually not reflexed. Stamens 10, filaments 1.8–2 mm. long, anthers subglobose, 0.4 mm. in diam. Disk densely pilose. Style 2 mm. long, glabrous. Fruit about 5 × 10 mm., sparsely pubescent, 5-winged, two wings transversely elongated to about 5 mm., the other three usually rudimentary (or vestigial) not more than 1 mm. in width.

From Mexico to Guiana, Trinidad, Brazil and Peru. The wood is said to be very hard and of good quality.

CANAL ZONE: Victoria Fill, near Miraflores Lock, *Allen 1754*; Paraíso Station, *Hayes 718, s. n.* PANAMÁ: near Cerro Jefe, alt. 600 m., *Allen 3436*.

In most American botanical works this species is called *Terminalia obovata* (Ruiz & Pav.) Steud (1841) but this name is preoccupied by *T. obovata* Cambess. (1829). The epithet is also antedated by *Chuncoa amazonia* J. F. Gmel.

2. TERMINALIA CHIRIQUENSIS Pittier, in Contrib. U. S. Nat. Herb. 18:238. 1917.

Tree up to 30 m. tall. Branchlets rufous-sericeous when young, soon glabres-

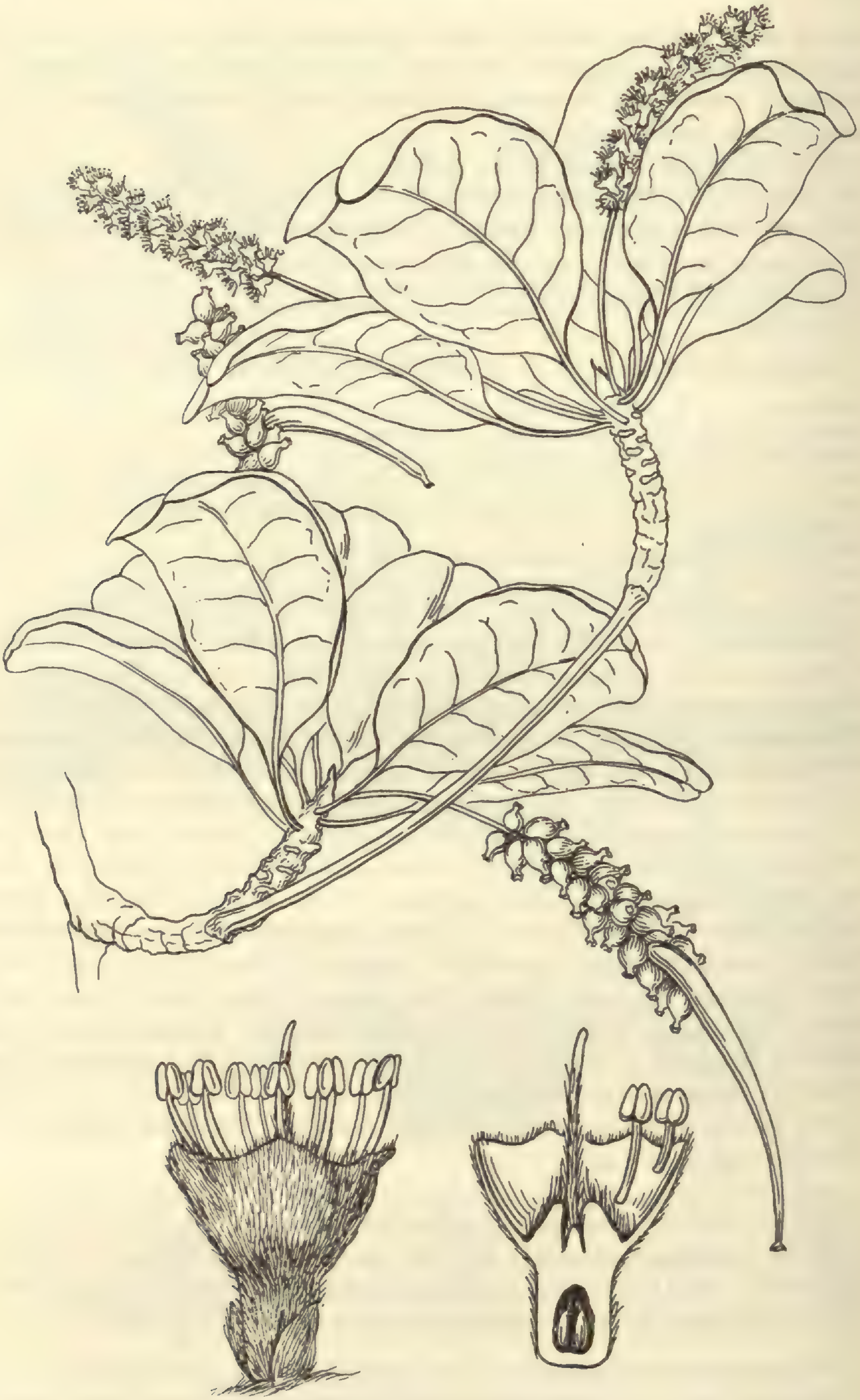

Fig. 48. *Bucida buceras*

cent. Leaves spirally arranged, often pseudo-whorled at the ends of the branchlets, membranaceous to chartaceous, petiolate, petiole 2–18 mm. long, rufous-sericeous when young, lamina elliptic, 10–18 × 4–6 cm., rufous-sericeous when young and retaining some pubescence on the nerves when adult, otherwise nearly glabrous, minutely verruculose above, pellucid-punctate at least in some stages, acuminate at the apex, cuneate at the base. Flowers yellowish-green, sessile, apparently all perfect, in axillary spikes 8–11 cm. Fruit transversely oval, about 1.5–2.0 × 2.5–3.5 cm., pale greenish yellow, glabrous, subsessile, samaroid, 3-winged, the 2 lateral very broad and pronounced, about 1.5 cm. wide, the 1 adaxial merely carinate and less than 1 mm. wide.

Panama, Costa Rica.

BOCAS DEL TORO: Almirante, *Cooper & Slater 55*, *Seibert 1534*.

The description of the fruit is taken from *Skutch 4252* (MO), collected in the vicinity of El General, Prov. San José, Costa Rica, the flowering companion sheet of which (*Skutch 3990*, MO) agrees well with *Seibert 1534* (MO).

3. BUCIDA L.

BUCIDA L. Syst. Nat. 2:1025. 1759, nom conserv.

Buceras P. Br. Hist. Jam. *t. 23*. 1756, nom rejic.

Trees. Leaves spirally arranged, usually pseudo-whorled. Upper receptacle remaining attached to the fruit and calyx-lobes scarcely developed. Fruit not winged, slightly oblique. Other characters as in *Terminalia*.

Two or three species from Florida, Central America, Guiana (*fide* Pulle) and in the West Indies.

Grounds for separating this genus from *Terminalia* are slender; Bentham and Hooker and a few other authors have not maintained it. The apparently excellent character of the persistent upper receptacle suffices adequately to distinguish the two genera in the New World but one or two Malayan-Polynesian species of *Terminalia*, quite unrelated to *Bucida*, show the same feature. There seems, however, no grave disadvantage in maintaining the status quo.

1. BUCIDA BUCERAS L. Syst. Nat. 2:1025. 1759.

Buceras bucida Crantz, Inst. Rei Herb. 1:133. 1766.
Terminalia buceras (L.) Wright, in Sauv. Fl. Cub. 38. 1868.
Myrobalanus buceras (L.) O. Kuntze, Rev. Gen. 237. 1891.

Medium-sized tree, 5–20 m. high. Branchlets at first sericeous, sometimes spiny (but apparently rarely in Panama); growth sympodial. Leaves coriaceous, pseudo-whorled at the tips of the branchlets, shortly petiolate, petiole 2–10 mm. long, sericeous, eventually glabrescent, lamina elliptic, narrowly elliptic or obovate-elliptic, 2–9 × 1–4 cm., pilose-sericeous when young, later appressed-pilose, appressed-pubescent or nearly glabrous, blunt or rounded at the apex, cuneate at the base and often with two not very conspicuous glands. Flowers pale green (or

Fig. 49. *Buchenavia capitata*

violet?), 5-merous, sessile, mostly perfect, in axillary spikes 2–8 cm. long, rhachis appressed-pubescent. Lower receptacle 1–1.5 mm. long, sericeous-tomentose; upper receptacle shallow-cupuliform, 1 × 2.5 mm., appressed-pubescent, persistent. Calyx-lobes little developed. Stamens 10, filaments 4 mm. long, anthers 1 mm. long. Disk 5-lobed, round the base of the style. Style 3.5 mm. long, glabrous. Fruit ovoid or pyriform, up to 4–6 × 2.5–4.5 mm., slightly and somewhat unequally 5-lobed, often slightly contorted, not winged, densely appressed-pubescent, crowned by the persistent upper receptacle (calyx), often galled.

Florida to Guiana (*fide* Pulle) and in the West Indies.

BOCAS DEL TORO: southwest of Bocas at Macaw Hill, *Von Wedel 557*; vicinity of Chiriquí Lagoon, Isla Colón, *Von Wedel 2929*. CANAL ZONE: Aspinwall, *Hayes 24, s. n.*

This species is very variable in size and shape of leaf and presence or absence of spines. As far as can be judged from the small amount of material seen, it is mainly the larger-leaved spineless form which occurs in Panama. In the West Indies forms with very much smaller leaves and well developed spines occur and *Bucida spinosa* Jennings (*Terminalia spinosa* Northrop, non Engl.) from the Bahamas, with leaves only about 1 cm. long and numerous spines, has been separated as a distinct species. The sterile specimen *Von Wedel 557* from Macaw Hill has narrow leaves and one or two spines. It is described, possibly erroneously, as having violet flowers.

The timber is said to be useful.

4. BUCHENAVIA Eichl.

BUCHENAVIA Eichl. in Flora 49:164. 1866.

Hudsonia A. Robinson, ex Lunan, Hist. Jam. 2:310. 1814, not L. (1767).

Trees or shrubs. Leaves alternate or pseudo-whorled. Flowers 5-merous, perfect and staminate together in elongated or subcapitate axillary spikes. Petals absent. Stamens 10, anthers adnate to the filaments, immobile. Fruit fleshy, 5-ridged or 5-angled, endocarp sclerenchymatous.

12–15 species, throughout tropical America.

1. BUCHENAVIA CAPITATA (Vahl) Eichl. in Flora 49:164. 1866.

Bucida capitata Vahl, Eclog. Amer. 1:50. *t. 8, fig. 1.* 1796.
Hudsonia arborea A. Robinson, ex Lunan, Hist. Jam. 2:310. 1814.
Terminalia obovata Cambess. in St.-Hil. Juss. & Cambess. Fl. Bras. Merid. 2:241. 1829.
Terminalia hilariana Steud. Nomencl. Bot. 2:668. 1841.

Tree of about 8 m., branchlets rufous-tomentose when very young, soon glabrescent; growth sympodial. Leaves pseudo-whorled at the tips of the branchlets, chartaceous to subcoriaceous, petiolate or subsessile, petiole up to about 6 mm. long, rufous-pilose at first, later glabrescent, lamina obovate-cuneate, usually rounded at the apex and decurrent into the petiole, 2–9 × 1–3.5 cm., tomentose when young becoming glabrous. Flowers mostly perfect, 5-merous, sessile, in subcapitate spikes, peduncles 1.5–7 cm. long, rufous-tomentose when young, glabrescent. Lower receptacle 1–3 mm. long, narrowed and slightly twisted at the apex,

Fig. 50. *Conocarpus erectus*

densely sericeous; upper receptacle shallow-cupuliform, 1 × 2.5 mm., sparsely pubescent or nearly glabrous. Calyx-lobes obsolete. Petals absent. Stamens 10, biseriate, filaments about 2 mm. long, anthers about 0.6 mm. long, adnate to the filaments. Disk patelliform with a free, densely pilose margin. Style subulate, 3.5 mm. long, glabrous. Fruit greenish-yellow (black when dried), ellipsoid, somewhat flattened, more or less 5-ridged, 2–3 × 1–1.5 cm., mesocarp fleshy, endocarp hard and stony.

Panama to Bolivia and northern Brazil, and in the West Indies.

PANAMÁ: Río La Maestra, 0–25 m. alt., *Allen 35*.

5. CONOCARPUS L.

CONOCARPUS L. Sp. Pl. 1:176. 1753; Gen. Pl. 81. 1754.

Rudbeckia Houst. ex L. loc. cit. 1754, in syn. non L. (1753).
Rudbeckia Adans. Fam. 2:80, 599. 1763, nom. illegit. non L.

Small trees or shrubs, erect or prostrate. Leaves alternate. Flowers sessile, 5-merous, perfect and staminate in the same inflorescences, densely aggregate into pseudo-capitula. Petals absent. Stamens usually 10, sometimes fewer by abortion, anthers dorsifixed, versatile. Disk intrastaminal. Ovules 2, pendulous. Fruits (pseudocarps) laterally compressed, 2-winged, densely aggregated in a cone-like mass.

A genus consisting of two littoral species, often constituents of mangrove swamps, one in tropical and subtropical America and Africa, the other in Somaliland and Arabia.

1. CONOCARPUS ERECTUS L., Sp. Pl. 1:176. 1753, Var. ERECTUS.

Conocarpus procumbens L. loc. cit. 177. 1753.
Conocarpus supinus Crantz, Inst. Rei Herb. 1:355. 1766.
Conocarpus acutifolius Humb. & Bonpl. ex Roem. & Schult. in L. Syst. Veg. 5:574. 1819.
Conocarpus erectus var. *arboreus* et *procumbens* DC. Prodr. 3:16. 1828.
Conocarpus pubescens Schumach. in Kongel. Dansk. Vid. Selsk. Naturvid. & Math. Afh. 3:135. 1828.
Terminalia erecta (L.) Baill. Hist. Pl. 6:266, 275. *fig. 240*. 1877.

This has been placed under var. *erectus* for nomenclatural reasons, not with any intention of considering that the erect form differs from the prostrate form but because var. *sericeus* (not occurring in Panama) may be a distinct taxon.

Small tree up to about 8 m. high, sometimes sprawling or procumbent, with stilt-roots and flattened, slightly winged branchlets, usually appressed-pubescent at first, soon glabrescent. Leaves alternate, shortly petiolate or subsessile, petiole up to 4 mm. long, pubescent or glabrous with two prominent glands near the apex or at the base of the lamina, papyraceous, chartaceous or subcoriaceous, somewhat fleshy, lamina narrowly elliptic, up to 11 × 3.5 cm., often much smaller, usually glabrous, rarely very sparsely pubescent, acute and slightly acuminate at the apex, cuneate at the base and often decurrent into the petiole; midrib fairly prominent on the under surface, lateral nerves and reticulation rather inconspicuous. Flowers

greenish-white, in the axils of small ovate or lanceolate ciliate bracts, aggregated in subglobose capitula, 3–5 mm. in diam., with sericeous peduncles 5–15 mm. long, forming a terminal panicle and capitula also sometimes solitary in the axils of the upper leaves. Lower receptacle (ovary) 1 mm. long, sericeous; upper receptacle (calyx) cupuliform, 1 × 1.5 mm., nearly glabrous, with lobes 0.5 mm. long. Stamens normally 10, biseriate, filaments 1.5–2 mm. long, anthers 0.5 mm. long. Disk pilose. Style 2 mm. long. Fruits squamiform, 3 × 3–3.5 mm., somewhat sericeous, recurved at the apex and often bearing the remains of the calyx, imbricated in a subglobose or cone-shaped structure, 1–1.5 × 0.7–1.3 cm.

Tropical and subtropical America and Africa.

BOCAS DEL TORO: Isla Colón, *Von Wedel 500*; Old Bank Island, *Von Wedel 2037*; Careening Cay, Chiriquí Lagoon, *Von Wedel 2813*. CANAL ZONE: without precise locality, *Allen 1725*. CHIRIQUÍ: San Bartolomé, Península de Burica, 0.5 m., *Woodson & Schery 938*. PANAMÁ: salt-marshes, *Barclay 2512*; Perlas Archipelago, San José Island, *Johnston 339*; vicinity of Bejuco, edge of mangrove-swamp, *Woodson, Allen & Seibert 1683*.

6. LAGUNCULARIA Gaertn. f.

LAGUNCULARIA Gaertn. f. in Gaertn. Fruct. 3:209. *t. 217*. 1807.

Horau Adans. Fam. 2:80, 585. 1763.
Sphenocarpus Rich. Demonstr. Bot. 92. 1808.
Rhizaeris Raf. Sylv. Tellur. 90. 1838.

The name *Laguncularia* Gaertn. f. is antedated by *Horau* Adans. and should be conserved.

Small trees and shrubs. Flowers sessile, 5-merous, mostly perfect with occasional staminate in terminal panicles of elongated spikes with additional spikes in the axils of the upper leaves. Receptacle infundibuliform, scarcely produced beyond the ovary, with 2 small adnate bracteoles near the apex and crowned with the persistent calyx. Petals 5, small. Stamens 10, biseriate, not exserted. Disk 10-rayed. Style subulate, capitate at the apex. Ovary unilocular with 2 pendulous ovules. Fruit almost sessile, longitudinally ribbed or narrowly winged, pericarp leathery.

A genus comprising one or perhaps two species inhabiting mangrove-swamps in tropical America and western tropical Africa and often dominant in such habitats.

1. LAGUNCULARIA RACEMOSA (L.) Gaertn. f. in Gaertn. Fruct. 3:209. *t. 217*. 1807.

Conocarpus racemosus L. Syst. Nat. 2:930. 1759.
Schousboa commutata Spreng. Syst. Veg. 2:332. 1825, nom. illegit.
Rhizaeris alba Raf. Sylv. Tellur. 90. 1838, nom. illegit.
Laguncularia obovata Miq. in Linnaea 18:752. 1844.

Small tree up to about 10 m. high or bush, with glabrous branchlets usually chestnut-brown when dried, slightly swollen at the nodes. Leaves opposite, decussate, petiolate, petiole 1–1.5 cm. long, glabrous, with two conspicuous glands 2–4 mm. below the apex, lamina chartaceous to subcoriaceous, elliptic or oblong-elliptic,

Fig. 51. *Laguncularia racemosa*

up to 10 × 5.5 cm., glabrous, usually blunt or rounded at the apex and slightly rounded at the base, lateral nerves rather numerous but inconspicuous, reticulation just visible. Flowers white or greenish-white, sessile, 5-merous, in terminal panicles up to about 20 cm. long of elongated spikes up to 7–8 cm. long, rhachis densely appressed-pubescent, bracts suborbicular to ovate, pubescent, 1.5 × 1.3 mm., soon caducous. Receptacle infundibuliform, elongating as the fruit develops, tomentellous, 2.5 × 1.5 mm., with two small obversely elliptic bracteoles, 1.5 × 2 mm., near the apex, expanded at the apex into a persistent cupuliform calyx with 5 broad lobes, imbricate in bud. Petals 5, suborbicular, appressed-pubescent. Stamens 10, filaments very short, inflexed in bud, inserted near the margin of the disk. Disk fleshy, 10-rayed. Style 1 mm. long, glabrous, stigma capitate. Fruit flattened-obovoid-ellipsoid, at first densely later sparsely appressed-pubescent, 12–20 × 6–10 mm. when mature, more or less longitudinally winged or ribbed, wing up to 2 mm. broad but usually less than 1 mm., crowned by the persistent remains of the calyx.

Florida to Peru and Brazil, also in West Indies, Galapagos Islands and Fernando do Noronha; in western tropical Africa from Senegal to Angola.

BOCAS DEL TORO: Perlas Islands, Trapiche, growing as isolated specimens on rocky beaches, *Allen 2616*; Isla Colón, southwest of Bocas, Macaw Hills, *Von Wedel 522*; Chiriquí Lagoon, *Von Wedel 1061*; vicinity of Chiriquí Lagoon, Nances Cay, *Von Wedel 2861, 2937*; CANAL ZONE: between Panamá and Corozal, alt. 20–30 m., *Pittier 4441*; banks of Río Grande, growing in mud, *Woodson, Allen & Seibert 763*. CHIRIQUÍ: San Bartolomé, Península de Burica, *Woodson & Schery 936*. PANAMÁ: Isla Taboga, 0–186 m., on rocky coast, *Woodson, Allen & Seibert 1534*.

I have seen specimens with glabrous flowers and fruits from southwest Florida (*Rugel 239*) and Cuba (*Jack 5255*) but not, as yet, from Panama. These may well be *Laguncularia glabriflora* Presl (Reliq. Haenk 2:22. 1831) though the latter was described as having red flowers (perhaps erroneously). The type is from Guayaquil. It would be interesting to study populations of *L. racemosa* to see whether glabrous-flowered plants occur. As far as the present meagre evidence goes it would seem that *L. glabriflora* could be treated as a glabrous variety of *L. racemosa* but without any well-marked geographical distribution.

MYRTACEAE

By G. J. H. AMSHOFF

Shrubs or trees with bicollateral vascular tissue and intraxylary phloem. Leaves opposite, rarely subalternate, simple, entire or at most crenulate, pellucid-punctate, these aromatic glands usually present also in other parts of the plant; stipules usually wanting. Inflorescence racemose or cymose, often paniculate, axillary or subterminal in the axils of the upper leaves before the development of the terminal bud or rarely truly terminal. Flowers 4- or 5-merous, hermaphrodite, regular, subtended by two opposite bracteoles. Sepals either free and usually imbricate in the bud or concrescent, calyptriform and circumscissile from the base at anthesis. Petals 4 or 5, rarely minute or wanting. Stamens usually numerous, inserted on the margin of the receptacle in 1 to several series; filaments incurved in the bud, rarely straight, often conspicuous by their length and color or at least by their number; anthers dorsifixed, rarely basifixed, 2-celled as a rule, dehiscing longitudinally, the connective usually terminating in a gland, the pollen trigonous, 3-porous. Ovary inferior, rarely subinferior, 2- to several-celled, the receptacle often produced above; placenta mostly axile; ovules 2 to several in each cell; style simple, filiform, the stigma small. Fruit a berry or a drupe or, in some Asiatic and Australian genera often cultivated in other countries, a loculicidal capsule; seeds without endosperm, the embryo straight or incurved with free or connate cotyledons (in the first case the radicle also free and the cotyledons either foliaceous and contort-plicate or thick and plano-convex).

Distribution: Species about 3000, chiefly in the tropics and in Australia. In Europe only *Myrtus communis*. The Central American genera fall into three subtribes.

A. Cotyledons free, foliaceous, more or less contort-plicate; radicle elongate, about as long as the cotyledons. Flowers mostly 5-merous, paniculate; ovary 2- to 3-celled, the ovules 2 in each cell. Berry mostly 1- or 2-seeded. (Subtribe MYRCIINAE)
  1a. Calyx concrescent, at anthesis circumscissile and falling away like a lid, remaining attached at one point, at last quite deciduous. Indumentum often formed by dibrachiate hairs ..... 1. CALYPTRANTHES
  b. Sepals free, imbricate in the bud. Hairs simple 2
    2a. Receptacle cup-like, produced above the ovary; berry globose ..... 2. AULOMYRCIA
    b. Receptacle not produced above the ovary; berry usually ellipsoid or oblong ..... 3. MYRCIA

B. Embryo straight, either homogeneous (the cotyledons and radicle connate) or with free plano-convex cotyledons and short radicle. Flowers mostly 4-merous, in more or less abbreviated racemes, often glomerate, rarely solitary or cymose; ovary 2(–3)-celled, the ovules 2 to several in each cell. Berry mostly 1-seeded, sometimes several-seeded. (Subtribe EUGENIINAE)
  1a. Inflorescence cymose; flowers large, the expanded cluster of stamens 2 cm. or more in diameter ..... 4. SYZYGIUM
  b. Inflorescences glomerate or racemose, rarely solitary or cymose; flowers small, the expanded cluster of stamens less than 1 cm. in diameter 2
    2a. Receptacle produced above the ovary, circumscissile at base. Ovules 2 or 4, ascending, in each cell of the ovary. Flowers glomerate ..... 5. MYRCIARIA

b. Receptacle not produced above the ovary. Ovules usually more than 2 in each cell of the ovary. Flowers in racemes, fascicles or glomerules, rarely solitary or cymose..... 6. EUGENIA

C. Embryo incurved, the radicle elongate, much longer than the minute cotyledons. Inflorescence usually 1- to 7-flowered and cymose on a long peduncle (or pedicel if flowers solitary). Ovary 2- to 7-celled; ovules several to numerous in each cell. Seeds mostly numerous, small. (Subtribe MYRTINAE)

1a. Bud closed, sepals not reflexed or spreading until anthesis..... 9. PSIDIUM

b. Bud open, sepals reflexed or spreading before anthesis.....2

2a. Filaments incurved in the bud, filiform; anthers dorsifixed. Leaves mediocre. ..... 7. CALYCOLPUS

b. Filaments straight or nearly so in the bud, flattened; anthers basifixed. Leaves very small..... 8. UGNI

In a recent publication by E. Kausel (in Ark. Bot. n. s. 3:491–516. 1956) the following information of systematic importance concerning the germination of the seed is given:

Myrcioideae (in Panama—*Myrcia*, *Aulomyrcia* and *Calyptranthes*): Germination epigaeous, the large foliaceous, contort-plicate, ensheathing cotyledons become the first assimilating leaves of the young seedling.

Myrtoideae (in Panama—*Ugni*, *Calycolpus* and *Psidium*): Germination epigaeous, the cotyledons very small.

Eugenioideae (in Panama—*Eugenia* and *Myrciaria*): Germination hypogaeous, the cotyledons remaining in the seed under the ground.

Beside the genera enumerated in the key, representatives of the Australian genera *Melaleuca* and *Eucalyptus* are cultivated in Panama. *Melaleuca leucodendron* L. is an ornamental shrub or small tree with narrowly lanceolate, alternate leaves with conspicuous longitudinal nerves and flowers in terminal spikes. It is cultivated in the Plant Introduction Garden at Summit, Canal Zone, and probably elsewhere.

The most frequently cultivated species of *Eucalyptus* is *E. globulus* Labill. planted as a shade tree. *Pimenta officinalis*, the Allspice, is planted in various parts of temperate and hot regions of tropical America, but has not yet been reported from Panama.

1. CALYPTRANTHES Sw.

CALYPTRANTHES Sw. Prodr. Veg. Ind. Occ. 79. 1788, nomen conservandum.

Chytraculia P. Br. Hist. Jam. 239. 1756.
Chytralia Adans. Fam. 2:80. 1763.
Suzygium P. Br. ex Adans. loc. cit. 244. 1763.
Calypthranthes Raeuschel, Nom. ed. 3. 144. 1797.
Calyptranthus Juss. Dict. Sci. Nat. 6:274. 1817.

Shrubs or trees, the indument if present partly or entirely composed of dibrachiate hairs. Inflorescence cymose-paniculate, several-flowered, rarely only 3-flowered, usually subterminal. Receptacle distinctly produced above the ovary. Calyx concrescent, circumscissile at anthesis but the calyptra remaining attached at one point. Petals minute or wanting. Stamens numerous, incurved in the bud; anthers ovate, 2-celled, dorsifixed, opening by longitudinal slits. Ovary 2- to

3-celled; cells 2-ovulate, the ovules ascending; stigma simple. Berry globose, crowned by the persistent free margin of the receptacle, 1- to 2-seeded, cotyledons free, contort-plicate, the radicle elongate.

Distribution: Species about 70 in tropical and subtropical America.

1a. Inflorescence 1- to 3-flowered, on a long slender peduncle..... 3. C. HYLOBATES
b. Inflorescence cymose-paniculate, several- or many-flowered.....2
1a. Leaves large 12–28 cm. long; flower buds globose, about 2.5 mm. high. 1. C. TUMIDONODIA
b. Leaves much smaller, less than 15 cm. long.....3
3a. Inflorescence and flower buds pubescent.....4
b. Inflorescence and flower buds quite glabrous, the ultimate flowers not more than 3 together, mostly pedicellate..... 2. C. SCHIEDEANA
4a. Ultimate flowers glomerate, sessile, up to 5 together; inflorescence shortly villous with stalked hairs..... 4. C. CHYTRACULIA
b. Ultimate flowers partly pedicellate, usually not more than 3 together; inflorescence finely sericeous with sessile hairs..... 5. C. COSTARICENSIS

Calyptranthes pittieri Standl. also recorded from Panama, but which I have not seen, seems to be characterized by its thick and coriaceous leaves less than 10 cm. long, and pubescent cymose-paniculate inflorescence with sericeous flower buds about 3.5 mm. long.

1. CALYPTRANTHES TUMIDONODIA Schery, in Ann. Missouri Bot. Gard. 30:215. 1943.

Calyptranthes urophylla Standl. & Williams, in Ceiba 3:215. 1953.

Shrubs about 2.5 m. high, or small trees, nearly glabrous. Twigs terete, with thickened nodes. Leaves elliptical or elliptical-oblong, long acuminate at the apex, acute at the base, glabrous above, sparsely pubescent or glabrate beneath, 12–28 cm. long and 5–9 cm. wide, membranaceous, the midrib impressed above, prominent beneath, the lateral nerves in about 25 pairs, slender, inconspicuous on both sides, the marginal nerve at about 2–3 mm. distant from the margin; petiole about 8 mm. long, thick, canaliculate. Inflorescence cymose-paniculate, about 9 cm. long, terminal and in the upper axils, lax and many-flowered, brown-pubescent with sessile dibrachiate hairs. Flower buds brown-pubescent, about 3 mm. high. Flowers whitish. Endemic. In the original description of *C. tumidonodia* both specimens of Von Wedel are cited. *Von Wedel 2195* was afterwards, apparently in haste, redescribed as *C. urophylla.*

BOCAS DEL TORO: Fish Creek hills, *Von Wedel 2195, 2223.*

2. CALYPTRANTHES SCHIEDEANA Berg, in Linnaea 27:28. 1855.

Myrcia aromatica Schlechtend. loc. cit. 13:415. 1839, non *Calyptranthes aromatica* St. Hil. (1828).
Calyptranthes schlechtendaliana Berg. loc. cit. 27:29. 1855.

Trees or shrubs, glabrous throughout, the twigs slender, subterete. Leaves petiolate, broadly elliptical to lanceolate- oblong, 4.0–7.5 cm. long and 2.0–4.5 cm. wide, acute or obtuse at the base, acuminate at the apex, chartaceous, the midrib impressed above, prominent beneath, the lateral nerves numerous, prominent on both sides, joining the marginal nerve near the margin; petiole about 4 mm. long. Inflorescence paniculate, many-flowered, about as long as the leaf, the ultimate

Fig. 52. *Calyptranthes chytraculia*

flowers sometimes 3 together, sessile, but for the greater part pedicellate. Flower buds globose, glabrous, 1.5–2.0 mm. high. Fruit globose, 4–6 mm. in diameter.

Mexico and Panama. Originally described from Mexico and quite common in that country.

PANAMÁ: Taboga Island, *Barclay s. n.* VERAGUAS: Coiba Island, *Seemann 624.*

3. CALYPTRANTHES **hylobates** Standl. spec. nov. ined. in herb.

Arbores parvae ca. 8 m. altae trunco ca. 10 cm. diam. ramulis gracilibus multo divisis apice quadrangularibus vel anguste alatis glabris. Folia oblonga membranacea glabra basi acuta apice longe acuminata 5–7 cm. longa 2.0–2.5 cm. lata nervo medio supra impresso subtus prominente nervis lateralibus numerosis tenuibus uterque superficieibus prominulis ca. 1 mm. ab margine in nervum marginalem collictis; petiolo brevi ca. 2 mm. longo. Inflorescentia 1- vel 3-flora pedunculo gracili usque 3.5 cm. longo glabro flore centrale sessile sive lateralibus usque 1 cm. longe pedicellatis. Flores adulti ignoti. Bacca globosa ut dicitur fulva; cotyledonibus foliaceis contorto-plicatis.

Panama and Costa Rica.

BOCAS DEL TORO: region of El Almirante, *Cooper 366* (HOLOTYPE, Herb. Chicago Nat. Hist. Mus.).

4. CALYPTRANTHES CHYTRACULIA Sw. Prodr. Veg. Ind. Occ. 79. 1788.

Shrubs or low trees, the young twigs subterete, sparsely pubescent, glabrescent. Leaves elliptical, acute at base, acuminate at apex, glabrous, chartaceous, up to 12 cm. long and 4.5 cm. wide, the midrib impressed above, prominent beneath, the lateral nerves numerous, prominulous on both sides, joining the marginal nerve very near the margin at about 1.5 mm. distance from the margin; petiole canaliculate, up to 8 mm. long, pubescent, glabrescent. Panicles nearly as long as the leaf, rarely shorter, brown-pubescent with dibrachiate stalked hairs, the branches 2–4 together, the ultimate flowers mostly sessile, sometimes partly pedicellate, 1–5 together in small glomerules. Flower buds obovoid, about 2 mm. high, brown-puberulous, opening with a shallow cup-like lid. Petals none. Filaments up to 4 mm. long; anthers small, at length twisted. Berry globose, glabrous; cotyledons contort-plicate.

Yucatan Peninsula, Guatemala and Panama; Jamaica.

BOCAS DEL TORO: Changuinola valley, *Cooper & Slater 143.*

The Panama specimen quite agrees with specimens from British Honduras distributed as *C. millspaughii* Urb. The inflorescence is usually larger than in Urban's description.

5. CALYPTRANTHES COSTARICENSIS Berg, in Linnaea 27:20. 1855.

Trees of 4–7 m., the crown dense and rounded, the branchlets puberulous, compressed. Leaves elliptical, acute at the base, shortly acuminate at the apex, chartaceous, glabrous except the midrib, 6–10 cm. long and 3–5 cm. wide, the

midrib impressed above, prominent beneath, striate-nerved with numerous lateral nerves, these prominulous on both sides and joining the marginal nerve very near the margin; petiole slender, canaliculate, about 5 mm. long. Panicles often longer than the leaf, puberulous with dibrachiate sessile hairs, the branches opposite or ternate, the ultimate flowers at most 3 together, sessile or pedicellate. Anthers 1 mm. long. Flower buds subglobose, about 3 mm. long, puberulous, opening with a petaloid concave lid. Berry globose, about 1 cm. in diameter.

The type specimen collected by Warscewicz "in Costa Rica et Veraguas" has not been seen by us, and apparently no other collections have since been made in Panama. Standley (Fl. Costa Rica 2:770. 1937) feels that the species may be endemic to Costa Rica and reports it as "Common in forests and thickets of the Meseta Central, at 1,100–2,000 meters."

2. AULOMYRCIA Berg

AULOMYRCIA Berg, in Linnaea 27:35. 1855.

Myrcia subgen. *Aulomyrcia* (Berg) Niedenzu, in Engl. & Prantl, Nat. Pflanzenfam. 3^7:75. 1893.

Shrubs or small trees. Inflorescence paniculate, axillary. Bracts and bractlets small, deciduous. Flowers mostly small, 5-merous or sometimes (not in the Central American species) 4-merous. Flower buds mostly obconic. Receptacle cup-like produced above the ovary, glabrous or pubescent outside, generally glabrous inside. Sepals imbricate, often very unequal, with the inner sepals much larger than the 3 outer sepals. Petals white, orbiculate or obovate. Stamens numerous, inserted on the free margin of the receptacle; filaments incurved in the bud; anthers ovate, dorsifixed, opening by longitudinal slits. Ovary 2- to 3-celled; ovules 2 in each cell, ascending. Berry globose, crowned with the cup-like, persistent, free margin of the receptacle and with persistent sepals, 1- to 3-seeded; cotyledons free, more or less contort-plicate; radicle elongated, inserted near the apex of the embryo.

Distribution: Species about 200 in tropical America. The genus is nearly allied to and often united with *Myrcia* DC. The cup-like produced receptacle of *Aulomyrcia*, a character so useful in distintinguishing other Myrtaceous genera, seems to be the only constant character to distinguish it from *Myrcia*.

1a. Leaves large, up to 30 cm. long..... 1. A. ZETEKIANA
b. Leaves small, 4–6 cm. long..... 2. A. TOMENTOSA

1. AULOMYRCIA **zetekiana** (Standl.) Amsh. comb. nov.

Eugenia Zetekiana Standl. in Journ. Wash. Acad. Sci. 15:286. 1925.

Shrubs 2.5–4.5 m. high, with few branches, the branchlets densely ferruginous-tomentose. Leaves lanceolate or narrowly oblong-lanceolate, about 30 cm. long, 6.5–9.5 cm. broad, attenuate at apex, rounded at base, coriaceous, glabrous above, tomentose beneath along costa, or glabrate, the venation reticulate, prominent on both sides, the costa stout, the lateral nerves about 20 on each side (young leaves dark purple, glabrous or nearly so); petiole swollen, nearly 1 cm. long. Flowers in

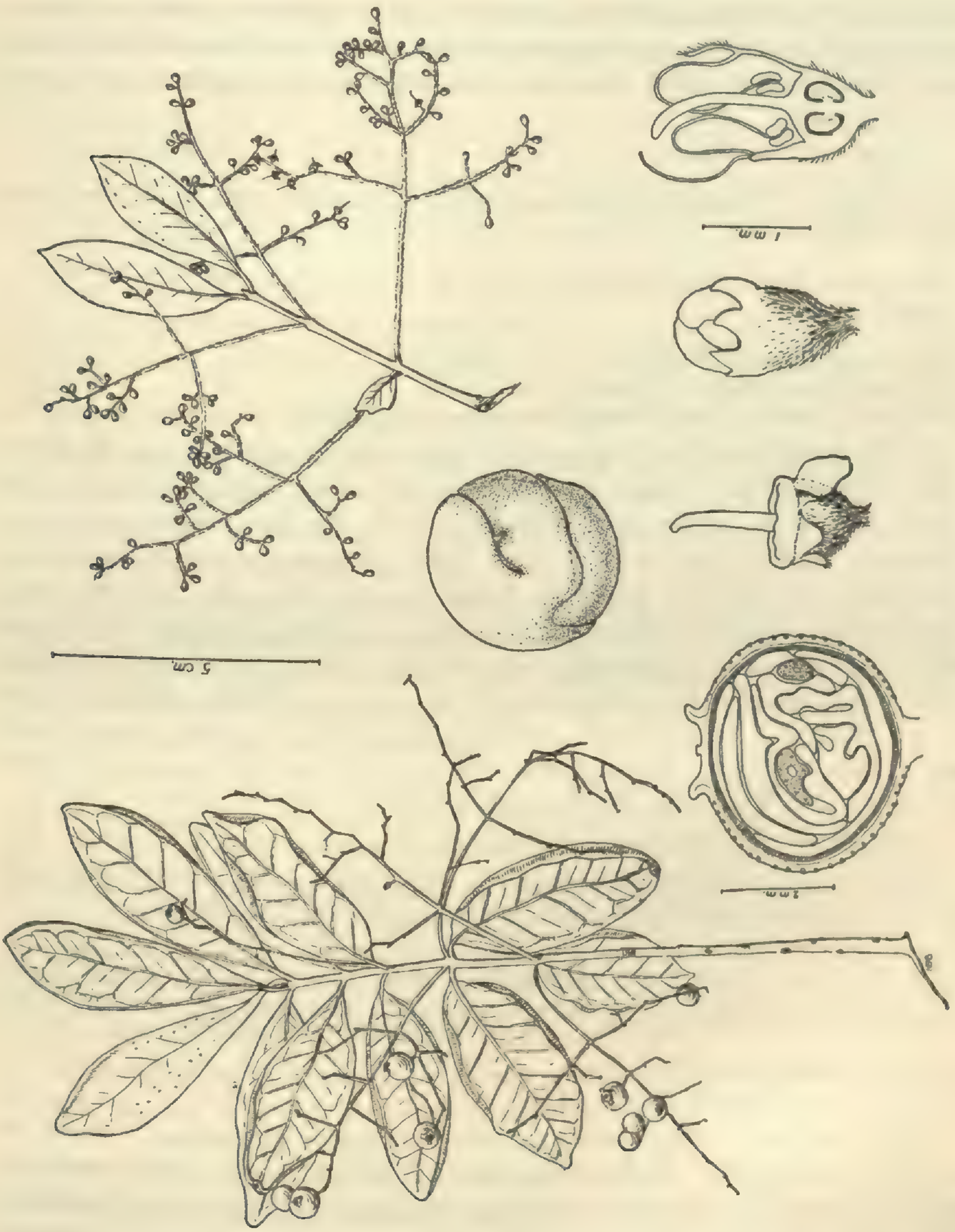

Fig. 53. *Aulomyrcia tomentosa*

terminal, simple or branched racemes 7–8 cm. long, densely velvety-tomentose. Flowers not known. Receptacle produced shortly beyond the ovary, tomentose outside. Sepals 5, subequal, semiorbicular, broadly rounded at apex (the shriveled remains in our specimens about 0.3 mm. long). Petals not seen. Berry globose, densely brown-tomentose, when dry about 1.5 cm. in diameter, green and brown, crowned by the persistent cup-like receptacle and sepals, 1- or 2-seeded. Cotyledons rather thick, plicate; radicle free, less than half the circumference of the seed (about one third).

Endemic, in wet forests.

CANAL ZONE: hills north of Frijoles, *Standley 27503*; hills west of the canal, near Gatún, *Standley 27192*.

2. AULOMYRCIA TOMENTOSA (Aubl.) Amsh. in Rec. Trav. Bot. Néerl. 39:153. 1942.

Eugenia tomentosa Aubl. Pl. Guian. 1:504. *t. 200*. 1775
Myrcia tomentosa (Aubl.) DC. Prodr. 3:245. 1828.
Eugenia vallis Standl. in Ann. Missouri Bot. Gard. 27:323. 1940.

Shrubs or small trees to 12 m. tall, the bark smooth, reddish brown, the young twigs densely villous. Leaves obovate, rounded, retuse, obtuse or shortly and obtusely acuminate at the apex, narrowed toward the base, membranaceous to chartaceous, at first pilose on both sides, later glabrescent especially above, 4–6 (–10) cm. long and 2–4 (–5) cm. broad; petiole pubescent, 2–5 mm. long. Panicles densely flowered, villous. Flowers white, pubescent, the buds 2.0–2.5 mm. high. Receptacle shortly produced above the ovary, white-villous outside, glabrous inside. Sepals unequal, the smallest about 1 mm. long and broad, the largest about 1.5 mm. long and 2 mm. broad. Petals suborbiculate, crenulate, about 2 mm. long. Ovary 2-celled. Berry globose, orange, 5–8 mm. in diameter, 1-seeded. Cotyledons contort-plicate, with elongate radicle.

Distribution: Panama to Brazil; Trinidad.

COCLÉ: vicinity of El Valle de Antón, alt. 600–1000 m., *Allen 1773, 2512, 2578*.
PANAMÁ: San José Island, Perlas Archipelago, *Johnston 801, 747, Erlanson 284*.

3. MYRCIA DC.

MYRCIA DC. ex Guillemin, Dict. Class. Hist. Nat. 11:378. 1826.

Aguava Raf. Sylva Tellur. 107. 1838.
Calycampe Berg, in Linnaea 27:129. 1856.

Shrubs or trees. Inflorescence paniculate, axillary or subterminal. Bracts and bractlets mostly small. Flowers 5-merous, in the bud more or less constricted under the calyx. Receptacle not or scarcely produced above the ovary, pubescent outside. Sepals imbricate, equal or slightly unequal. Petals white, orbiculate or obovate, pubescent outside. Stamens numerous; filaments incurved in the bud; anthers ovate, dorsifixed, opening with longitudinal slits. Ovary 2- to 4-celled, terminated by a sericeous disc; ovules 2 in each cell, ascending. Berry 1-seeded, ellipsoid, or 2- to 3-seeded and obovoid or subglobose when ripe, crowned by the

persistent sepals. Seeds with cartilaginous shining testa; cotyledons free, longitudinal (i.e. so placed in the fruit that they are parallel with the greatest length of the fruit), contort-plicate; radicle elongate, half-encircling the embryo.

Distribution: About 100 species in tropical America.

In Panama three rather distinct species can be distinguished. However the genus is badly in need of revision, since the differences are small and in some cases not constant. Four or five other species are known from Central America.

1a. Leaves large, 7–17 cm. long, laxly reticulate, the lateral nerves distant, at last impressed above and prominent beneath; twigs glabrous; flowers relatively large in lax and few-flowered glabrous inflorescences..... 2. M. COUMETA
b. Leaves smaller, usually not more than 10 cm. long, densely reticulate, the lateral nerves prominulous to obsolete above; twigs densely pubescent at least when young; flowers smaller, in dense more or less pubescent inflorescences. 2
2a. Leaves coarsely reticulate-veined, the young twigs and inflorescences more or less densely pubescent with spreading hairs..... 1. M. COSTARICENSIS
b. Leaves finely reticulate-veined, the young twigs and inflorescences sparsely and minutely pubescent..... 3. M. GATUNENSIS

1. MYRCIA COSTARICENSIS Berg, in Linnaea 27:104. 1854.

Shrubs or small trees 2–8 m. high, the crown dense and rounded, the young branchlets densely pubescent with spreading, somewhat brownish hairs. Leaves petiolate, lustrous, lanceolate-oblong or elliptical-oblong, commonly 4–7 cm. long, obtuse or rounded at the base, acuminate at the apex, at first sparsely pubescent on both sides, later glabrate, the lateral nerves prominulous on both sides; petiole about 3 mm. long. Panicles densely pubescent, densely flowered. Flowers white, fragrant. Receptacle sericeous, about 1.5 mm. high. Sepals about 1 mm. long, rounded. Petals about 3 mm. long, pubescent outside. Berry oblong, red to black.

Distribution: Costa Rica and Panama.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 178, 197, 395.* CHIRIQUÍ: valley of the upper Río Chiriquí Viejo, *P. White 191, 337*; vicinity of Boquete, *Allen 4667, Davidson 622, 758*; trail from Bambito to Cerro Punta, *Allen 317*; Finca Lérida to Boquete, *Woodson, Allen & Seibert 1100*; vicinity of Callejón Seco, Volcán de Chiriquí, alt. 1700 m., *Woodson & Schery 497*; vicinity of Bajo Mona and Quebrada Chiquero, alt. 1500 m., *Woodson & Schery 536*; llanos on slopes of Volcán de Chiriquí along Río Chiriquí Viejo, 1200 m., *Allen 1005.* COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1304*; hills south of El Valle de Antón, alt. about 700 m., *Allen 2519, 2493.* PANAMÁ: Isla Taboga, ca. 0–186 m., *Woodson, Allen & Seibert 1446*; La Chorrera, alt. 200 ft., *Bro. Paul 818.* VERAGUAS: Cañazas, *Allen 163.*

This species, known locally as *arrayán* (myrtle) is the most common *Myrcia* species in Panama, several times collected in nearly all provinces.

2. MYRCIA COUMETA (Aubl.) DC. Prodr. 3:245. 1828.

Eugenia Coumeta Aubl. Pl. Guian. 1:497. *t. 196.* 1775.
Aulomyrcia Coumeta (Aubl.) Berg, in Linnaea 27:60. 1855.

Shrubs or small trees, the twigs almost glabrous. Leaves ovate or ovate-oblong, acute or obtuse at the base, acuminate at the apex, 7–17 cm. long and 4–6 cm. wide, the principal lateral nerves distant, at last impressed above and prominent beneath, the veins laxly reticulate; petiole robust, about 5 mm. long. Panicles

Fig. 54. *Myrcia costaricensis*

nearly glabrous, distantly flowered, with 3–5 pairs of 1- to 9-flowered branches, the pedicels slender, up to 8 mm. long. Flowers larger than in the two other species, the sepals typically up to 2 mm. long, the petals about 4 mm. long. Berry globose in the Panama specimens.

The typical form in French Guiana, Surinam, and also in Costa Rica; the following Panama specimens seem to belong to this species although their fruit is globose instead of oblong and the flowers are not yet fully developed. In Costa Rica the species has been confused with *Myrcia carnea* (Mey.) DC., described from British Guiana but still imperfectly known.

BOCAS DEL TORO: Fish Creek hills, *Von Wedel 2441, 2871, Cooper 570.*

3. MYRCIA GATUNENSIS Standl. in Publ. Field Mus. Bot. 4:154. 1929.

Twigs and inflorescences minutely and finely pubescent. Leaves lanceolate-oblong or elliptical, rounded or obtuse at the base, rather long-acuminate, 7–10 cm. long, chartaceous, the lateral nerves numerous, delicate, prominulous on both sides or obsolete above, the veins densely and finely reticulate, not conspicuous; petioles mostly about 2 mm. long, sometimes longer. Inflorescence slender, shorter than the leaf. Flowers minute, the petals 1.5–2.0 mm. long.

Apparently endemic.

CANAL ZONE: Barro Colorado Island, *Kenoyer 468*; Barro Colorado Island, Barbour Point to next point south, *Bangham 498*; Barro Colorado Island, shores of Gatún Lake, south of Laboratory, *Bangham 451.*

Two other species sometimes are recorded for Panama. The first, *M. oerstedeana* Berg, described from Costa Rica, has leaves similar to those of *M. gatunensis* but is more pubescent; the Panamanian specimens previously referred to that species agree better with *M. costaricensis.* The second, *M. plicato-costata* Berg, is known from Costa Rica, but the record for Panama is dubious. It is questionable whether *M. costaricensis*, *M. gatunensis*, and *M. oerstedeana* are distinct species.

4. SYZYGIUM Gaertn.

SYZYGIUM Gaertn. Fruct. 1:166. 1788.

Opa Lour. Fl. Cochinch. 308. 1790.
Jambosa DC. Prodr. 3:286. 1828.
Microjambosa Blume, Mus. Bot. Lugd.-Bat. 1:117. 1849.

Shrubs or trees. Inflorescence usually centrifugal, cymose, more or less paniculate. Flowers 4-merous. Receptacle produced above the ovary. Sepals persistent, mostly semi-orbiculate, sometimes distinct. Petals free or coherent. Anthers dorsifixed, opening with longitudinal slits. Ovary 2(–4)-celled, the cells many-ovulate. Berry globose or pear-shaped, often carnose and edible, mostly 1-seeded. Testa adhering to the pericarp. Cotyledons free, carnose; radicle short, hidden between the cotyledons.

Distribution: Species about 200 in tropical and subtropical Asia, the following cultivated or sometimes naturalized in Panama.

1a. Flowers red; inflorescence mostly lateral, often cauliflorous..... 1. S. MALACCENSE
b. Flowers white; inflorescence chiefly terminal.....2
2a. Leaves lanceolate, acute at the base..... 2. S. JAMBOS
b. Leaves elliptical-oblong, rounded at the base..... 3. S. SAMARAGNENSE

1. SYZYGIUM MALACCENSE (L.) Merrill & Perry, in Journ. Arn. Arb. 19:215. 1938.

Eugenia malaccensis L. Sp. Pl. 470. 1753.
Jambosa malaccensis (L.) DC. Prodr. 3:286. 1828.
Jambosa domestica Bl. Mus. Bot. Lugd.-Bat. 1:91. 1849.

Low trees with very dense rounded crown. Leaves large, oblong-elliptical, obtuse or acute at the base, acute or acuminate at the apex, coriaceous, glabrous, 20–30 cm. long and 8–18 cm. wide, the lateral nerves in about 10–14 pairs. Inflorescences lateral, few-flowered. Flowers red. Receptacle glabrous. Sepals 4–8 mm. long. Petals orbiculate, red, 14–18 mm. long. Stamen filaments red, greatly exserted; anthers yellow. Berry obovoid, about 7 cm. long, whitish or yellowish or tinged with red.

Native of Asia, sometimes planted as a shade tree. The bright purple red flowers are exceptionally beautiful. They are borne amongst the leaves however and are not conspicuous when the tree is viewed from a distance; but the petals fall upon the bare soil beneath and form a lovely carpet. The fruit is called *marañón de Curasao*, a not inappropriate name, since the fruit strongly suggests, in shape and color, that of *Anacardium occidentale* L., called *marañón* throughout Central America. Another name is Malay apple or *manzana de Faiti*.

2. SYZYGIUM JAMBOS (L.) Alston, in Trimen, Handb. Fl. Ceylon 6: Suppl. 115. 1931.

Eugenia jambos L. Sp. Pl. 470. 1753.
Jambosa vulgaris DC. Prodr. 3:286. 1828.

Small trees though often 15 m. high, with a dense crown of green foliage. Leaves lanceolate, attenuate toward the acute apex, acute at the base, glabrous, coriaceous, 15–20 cm. long and 4–6 cm. wide, the lateral nerves in about 8 pairs, the marginal nerve at about 4 mm. from the margin. Inflorescence few-flowered, terminal, glabrous. Flowers, including the many filaments, about 5 cm. in diameter Receptacle glabrous, 1.5 cm. high. Sepals 4, semi-orbiculate. glabrous, about 7 mm. long. Petals about 1 cm. long, white. Berry pear-shaped or subglobose, about 3 cm. in diameter and 3.5–5.0 cm. long, pinkish or yellowish, 2- or several-seeded, crowned with the persistent incurved sepals.

Native of the East Indies and widely cultivated as a shade tree throughout tropical America because of the dense foliage, showy flowers and edible fruits. The fruit is not much esteemed in Central America, although elsewhere it is much used for the making of jellies. Known as *manzana* and *manzana rosa*, and in Panama the tree is usually called *pomarosa*; in English Rose apple, Malabar plum and Plum rose. It frequently escapes and naturalizes in Panama.

3. SYZYGIUM SAMARAGNENSE (Blume) Merrill & Perry, in Journ. Arn. Arb. 19: 115. 1938.

Eugenia javanica Lam. Encycl. 3:200. 1789, non *Sysyzium javanicum* Miq.
Myrtus samaragnensis Blume, Bijdr. 1084. 1826.
Jambosa samaragnensis (Blume) DC. Prodr. 3:286. 1828.

Trees. Leaves elliptical-oblong, rounded or subcordate at the base, mostly obtusely acuminate at the apex, 10–24 cm. long and 4–11 cm. wide, chartaceous, glabrous, aromatic. Inflorescence terminal or lateral, in the first case often many-flowered, the flowers usually in clusters of 3. Receptacle cup-like, produced above the ovary, about 12 mm. high. Sepals 4, semi-orbiculate, glabrous, about 4 mm. long. Petals and stamen filaments yellowish white, the petals about 1 cm. long, concealed by the elongate stamens. Berry pear-shaped or subglobose, about 3–5 cm. long, pinkish or white, carnose, insipid.

Native to the East Indies but cultivated throughout the tropics. In Panama it is less common than the two other species.

5. MYRCIARIA Berg

MYRCIARIA Berg, in Linnaea 27:320. 1856.

Shrubs or trees. Flowers subsessile, glomerate, axillary and lateral. Bractlets 2, enclosing the ovary, often connate at the base. Receptacle distinctly produced above the ovary, at last circumscissile. Sepals 4, imbricate in the bud and enclosing the petals. Petals small, fimbriate. Stamens numerous; filaments incurved in the bud; anthers ovate, dorsifixed, opening with longitudinal slits. Ovary 2- to 3-celled; cells 2- or 4-ovulate, the ovules ascending. Berry globose, crowned with the disc only. Embryo undivided.

Distribution: Species about 40 in tropical America.

1a. Leaves 2–5 (–7) cm. long, acute at the base..... 1. M. FLORIBUNDA
b. Leaves 5–12 cm. long, rounded to cordate at the base..... 2. M. VISMEAEFOLIA

1. MYRCIARIA FLORIBUNDA (West, ex Willd.) Berg, in Linnaea 27:330. 1856.

Eugenia floribunda West, ex Willd. Sp. Pl. 2:960. 1800.
Eugenia O'Neillii Lundell, in Bull. Torrey Bot. Club 64:555. 1937.
Myrciaria O'Neillii (Lundell) I. M. Johnston, in Sargentia 8:228. 1949.

Shrubs or small trees 2–10 m. high. Trunk 3–25 cm. in diameter, covered with a tight smooth light-brown exfoliating bark that is practically indistinguishable from that of its common associate *Calycolpus* (cf. I. M. Johnston, loc. cit. 1949). Twigs densely foliate, the internodes 1–2 cm. long, at first puberulous, soon glabrate. Leaves elliptic- to lanceolate-oblong or lanceolate, long-acuminate to caudate at the apex, acute at the base, 2–5 (–7) cm. long and 1.0–2.5 cm. wide, chartaceous, at first pubescent on the margin and midrib, soon glabrate, the midrib flat above, prominent beneath, the lateral nerves numerous, delicately prominulous to nearly obsolete on both sides, the marginal nerve 0.5–1.0 mm. within the margin; petiole slender, 2–5 mm. long. Flowers glomerate, 2–5 together. Receptacle glabrous, about 1.5 mm. long, at last circumscissile above the ovary. Sepals 4, imbricate, about 1 mm. long, deciduous with the receptacle. Petals obovate, fimbriate, slightly longer than the sepals. Ovary glabrous outside. Berry globose,

Fig. 55 *Myrciaria floribunda*

8–15 mm. in diameter, 1-seeded, edible. Embryo homogeneous; radicle broadly adnate.

Southern Mexico to Panama; Guiana and Brazil; West Indies. A common element in the understory of more or less shady forest at low elevations.

CANAL ZONE: hills north of Frijoles, *Standley 27521*; between France Field and Catival, Prov. Colón, *Standley 30192*; without precise locality, *Mrs. Epplesheimer anno 1910.* CHIRIQUÍ: east of Gualaca, *Allen 5027.* COCLÉ: vicinity of Natá, *Allen 837*; Bismarck, above Penonomé, 2000–3000 ft., *Williams 583.* PANAMÁ: San José Island, *Johnston 222, 283, 310, 435, 500, 523, 578, 603, 617, 715, 749, Erlanson 271.*

2. MYRCIARIA VISMEAEFOLIA (Benth.) Berg, in Linnaea 27:336. 1856.

Eugenia vismeaefolia Benth. in Hook. Journ. Bot. 2:320. 1840.

Shrubs or small trees 4–6 m. high, the trunk up to 1 dm. in diameter, the twigs glabrous and with distant foliage. Leaves oblong to lanceolate-oblong, 6–12 cm. long and 2–4 cm. wide, long-acuminate and acute at the apex, rounded or obtuse at the base, coriaceous, glabrous, the midrib slightly elevated above, prominent beneath, the lateral nerves numerous, delicate; petiole about 5 mm. long. Flowers glomerate, axillary and lateral, whitish, the bractlets small, connate, ciliate. Receptacle glabrous, at last circumscissile above the ovary. Sepals glabrous outside, puberulous inside, imbricate in the bud with 2 smaller and 2 larger. Petals 4, about 2 mm. long, pubescent, fimbriate. Ovary 2-celled, 4-ovulate, the ovules ascending. Berry globose, up to 1 cm. in diameter, 1- to 3-seeded, blackish blue when dry, edible. Embryo homogeneous.

Distribution: Panama, British Guiana and Surinam. The description as given here refers to the Panamanian variety, which differs from the typical form of the Guianas by its firmer leaves which are never (?) cordate at the base, its longer petioles and its slightly larger flowers.

CANAL ZONE: Summit, *Zetek 3520.*

6. EUGENIA L.

EUGENIA L. Sp. Pl. 470. 1753.

Catinga Aubl. Hist. Pl. Guian. 1:511. *t. 203.* 1775.
Greggia Gaertn. Fruct. 168. *t. 33.* 1788.
Guapurium Juss. Gen. 324. 1789.
Olynthia Lindl. Collect. *t. 19*, in obs. 1821.
Jossinia Comm. ex DC. Prodr. 3:237. 1828.
Calophylloides Smeathm. ex DC. loc. cit. 272. 1828.
Opanea Raf. Sylva Tellur. 106. 1838.
Epleienda Raf. loc. cit. 107. 1838.
Lomastelma Raf. loc. cit. 1838.
Malidra Raf. loc. cit. 1838.
Suarda Nocca, ex Steud. Nomencl. 2:651. 1841.
Cerocarpus Hassk. in Flora 25:2 Beibl. 36. 1842.
Syllysium Meyen & Schau. in Nova Acta Acad. Nat. Cur. 19: Suppl. 1. 334. 1843.
Phyllocalyx Berg, in Linnaea 27:306. 1856.
Stenocalyx Berg, loc. cit. 309. 1856.
Myrcianthes Berg, loc. cit. 315. 1856.
Hexachlamys Berg, loc. cit. 345. 1856.

Anamomis Griseb. Fl. B. W. I. 240. 1860.
Psidiastrum Bello, in Anal. Soc. Españ. Hist. Nat. 10:272. 1881.
Myrtopsis O. Hoffm. in Linnaea 43:133. 1881.
Pseudoeugenia Scortech. in Journ. Bot. 23:153. 1885.
Oxydiastrum Niedenzu, in Engl. & Prantl, Nat. Pflanzenfam. 3^7:105. 1893.
Chloromyrtus Pierre, in Bull. Soc. Linn. Paris, n. ser. 71. 1898.

Shrubs or trees. Flowers tetramerous, in axillary or lateral racemes, fascicles or glomerules, rarely solitary or cymose. Receptacle scarcely or not produced above the ovary. Sepals free, imbricate, the two inner mostly distinctly larger than the two outer, persistent. Petals free, often caducous. Stamens numerous; filaments incurved in the bud; anthers dorsifixed, opening with longitudinal slits. Ovary 2(–3)-celled, the cells several- to many-ovulate, sometimes only 2-ovulate. Berry globose or ellipsoid, mostly 1-seeded, rarely few-seeded. Embryo homogeneous, the radicle broadly adnate to the wholly connate cotyledons, or sometimes cotyledons with a short split between them (or in one species in Panama, also aberrant by its cymose inflorescence, with cotyledons free and radicle short but distinct).

Distribution: Species numerous, probably more than 1000, in the tropics and subtropics, chiefly in America. The genus sometimes is united with *Syzygium* Gaertn., and then a few hundred additional species must be added.

1a. Inflorescence cymose, 1- to 7-flowered; cotyledons free..... 3. E. FRAGRANS
b. Inflorescence various, but never cymose; cotyledons connate.....2
2a. Berry distinctly ribbed.....3
b. Berry smooth or at most faintly ribbed.....4
3a. Leaves ovate; flowers solitary in the axils of bracts at the base of young shoots, or in fascicles of 4–8, the pedicels 1.5 cm. long or more; berry depressed-globose, 2.5–3.0 cm. in diameter..... 2. E. UNIFLORA
b. Leaves elliptical; flowers in short racemes, the pedicels 4–8 mm. long; berry obovate-oblong, up to 1.5 cm. long..... 17. E. OCTOPLEURA
4a. Leaves linear, less than 5 mm. wide; flowers solitary, on long slender pedicels..... 1. E. ALFAROANA
b. Leaves broader, about 1 cm. wide or more; flowers glomerate, fasciculate, or racemose.....5
5a. Flowers precocious, fasciculate, the pedicels white-pilose, the ovary densely puberulous; leaves small, about 5 cm. long, the marginal nerve at some distance from the margin..... 5. E. NESIOTICA
b. Flowers present at the same time as fully developed leaves.....6
6a. Leaves small, mostly less than 5 cm. long, subsessile if up to 6 cm. long.....7
b. Leaves larger, as a rule more than 5 cm. long, or definitely petiolate if shorter.....9
7a. Flowers glomerate; leaves almost sessile, oblong to lanceolate..... 6. E. PITTIERI
b. Flowers in fascicles or in abbreviated racemes, long-pedicellate.....8
8a. Inflorescence an abbreviated 1- to 4-flowered raceme; the pedicels 4–10 mm. long; leaves oblong or lanceolate-oblong..... 7. E. CHEPENSIS
b. Inflorescence an axillary 6- to 15-flowered fascicle, the pedicels 4–6 mm. long; leaves elliptical..... 8. E. COSTARICENSIS
9a. Leaves lanceolate, long-acuminate and mucronate, sparsely white-pilose to glabrescent on both sides, up to 7 cm. long; inflorescence and ovary pubescent; flowers racemose..... 4. E. BIFLORA
b. Leaves elliptical or oblong.....10
10a. Twigs glabrous or puberulous; leaves and ovary always glabrous (see also *E. salamancana*, no. 15).....11
b. Young twigs densely pubescent with patent hairs; leaves remaining long-pubescent or sericeous at least beneath; ovary pubescent or glabrous.....17
11a. Flowers distinctly racemose (sometimes partly solitary), the rachis much longer than the pedicels; leaves acuminate.....12

b. Flowers fasciculate or in more or less abbreviated racemes: leaves obovate, rounded or obtuse and scarcely acuminate at the apex.....13
12a. Flowers small, the petals about 3 mm. long; rachis and pedicels very slender..... 11. E. OERSTEDEANA
b. Flowers larger, the petals about 6 mm. long; plant more robust in all parts. ..... 10. E. COLORADENSIS
13a. Leaves very large, 20–25 cm. long..... 12. E. sp.
b. Leaves much smaller.....14
14a. Flowers minute, the sepals about 1 mm. long, the petals about 3 mm. long; inflorescence an abbreviated raceme with slender rachis and pedicels, rarely partly fasciculate..... 13. E. ACAPULCENSIS
b. Flowers larger, the petals 5–7 mm. long; inflorescence more robust.....15
15a. Leaves obovate, rounded, obtuse or subtruncate at the apex; inflorescence poorly known but possibly cymose, 3-flowered (but embryo homogeneous). ..... 14. E. HIRAEIFOLIA
b. Leaves elliptical, ovate or oblong.....16
16a. Sepals very short, about 1 mm. long, even in the bud much shorter than the petals..... 16. E. TAPACUMENSIS
b. Sepals larger, unequal, 3–5 mm. long, covering the petals in the bud. 18. E. AUSTIN-SMITHII
17a. Leaves sericeous beneath with a shining golden, eventually fading indumentum; flowers pedicellate..... 19. E. CHRYSOPHYLLUM
b. Leaves pubescent with spreading hairs, glabrescent or glabrous; twigs loosely pubescent. 18
18a. Leaves coriaceous, the nerves indistinct and the venation obsolete, glabrous; inflorescence and flowers poorly known..... 15. E. SALAMANCANA
b. Leaves membranaceous, the nerves distinct, glabrous.....19
19a. Flowers small, sessile or nearly so, glomerate, the sepals not more than 1 mm. long..... 9. E. ORIGANOIDES
b. Flowers larger, long-pedicellate (up to 1 cm.), fasciculate, the sepals up to 4 mm. long..... 20. E. OREINOMA

The most common species are *E. acapulcensis* and *E. origanoides* which are probably to be found in all provinces. The first species is glabrous and easily recognizable by its minute flowers in slender abbreviated racemes; the second species is pubescent and has equally small but glomerate flowers. *E. biflora*, particularly frequent on Taboga Island but probably scattered throughout the country, has narrowly lanceolate leaves and pubescent few-flowered racemes. *E. fragrans* is particularly frequent in the Chiriquí region, and is the only species with a dichotomously branched inflorescence. *E. oerstedeana* and *E. coloradensis*, both with flowers in long glabrous racemes, *E. chepensis*, with small leaves and flowers in abbreviated, nearly glabrous racemes, and *E. nesiotica*, with pubescent, fasciculate, precocious flowers and small leaves, are most common in the Canal Zone. All other species have been collected but once or twice, some in recent years and others in the last century.

1. EUGENIA ALFAROANA Standl. in Journ. Wash. Acad. Sci. 14:240. 1924.

Shrubs 1–5 m. high, densely branched, the branchlets very slender, thinly pilose-sericeous. Leaves linear or nearly so, often broadened near the base, 5–6 cm. long, 1.5–4.0 mm. wide, acute at the base, acute and aristate-mucronate (bristle about 1.5 mm. long) at the tip, thin, when young thinly sericeous-pilose with whitish hairs, soon glabrate; petioles 2–4 mm. long, tomentose and pilose. Flowers axillary, solitary on long, slender, appressed-pilose pedicels 1.5–2.0 cm. long. Bractlets 2 at the base of the calyx, filiform, 2–3 mm. long. Sepals ovate, subulate-acuminate,

2–3 mm. long, tomentose or glabrate. Petals broad, white, 3 mm. long, ciliolate, copiously gland-dotted. Ovary 2 mm. high, densely white-tomentose, 2-celled, each cell with 3–4 relatively large ovules. Berry purple-black, 6–7 mm. in diameter, glabrate, crowned with the persistent sepals, 1-seeded; seed about 6 mm. in diameter, the embryo homogeneous.

El Salvador, Panama. *Escoba* (in Panama).

CHIRIQUÍ: Sabana de El Boquete, alt. 700–1100 m., *Pittier 3302*.

The specimen cited is sterile; flowering material is needed for more sure determination.

2. EUGENIA UNIFLORA L., Sp. Pl. 470. 1753.

Eugenia michelii Lam. Encycl. 3:203. 1789.
Stenocalyx michelii (Lam.) Berg, in Linnaea 27:310. 1856.

Shrubs or small trees 3–10 m. high. Leaves ovate to ovate-lanceolate, shortly acuminate, obtuse to rounded or subcordate at the base, 2.5–6.0 cm. long and 1.5–3.5 cm. broad, chartaceous, glabrous, lateral nerves prominulous on both sides, arcuate-anastomosing at about 3 mm. within the margin, the veins laxly reticulate; petiole about 2 mm. long. Flowers solitary in the axils of bracts at the base of young shoots or sometimes in fascicles of 4–8; bracts scarious, up to 5 mm. long. Pedicels slender, glabrous, 1.5–2.0 cm. long. Sepals oblong, ciliate, up to 4 mm. long, glabrous. Petals obovate, unguiculate, 8–12 mm. long. Ovary glabrous, 8-ribbed, 2-celled; cells several (10–14-) ovulate; placenta peltate, thickened in the middle. Berry depressed-globose, 8-ribbed, 1-seeded, 2.5–3.0 cm. in diameter, red, edible. Cotyledons partly free.

Cultivated in the tropics and subtropics, native of tropical America. The fruits are edible, sweet, aromatic and of excellent flavor. The shrubs are especially well-adapted to cultivation as a hedge plant (Standley). Vernacular name: Surinam Cherry.

CANAL ZONE: Barro Colorado Island, *Shattuck 71*.

3. EUGENIA FRAGRANS (Swartz) Willd. Sp. Pl. 2:964. 1800.

Myrtus fragrans Swartz, Prodr. Veg. Ind. Occ. 79. 1788.
Anamomis fragrans (Swartz) Griseb. Fl. Brit. W. Ind. 240. 1860.
Eugenia storkii Standl. in Field Mus. Publ. Bot. 8:143. 1930.
Myrcia seleriana Donn. Sm. in Bot. Gaz. 27:332. 1894.

Small trees 3–8 m. high, almost glabrous. Leaves petiolate, elliptic to obovate, acute at the base, obtuse or very shortly acuminate at the apex, 2–6 cm. long and 1.5–3.0 cm. wide, thick and coriaceous, glabrous, the midrib impressed above, prominent beneath, the lateral nerves usually prominulous on both sides. Flowers in axillary 3- to 7-flowered cymes, the central flower(s) sessile, the lateral pedicellate. Peduncle up to 3.5 cm. long. Flowers 4-merous, white, fragrant. Sepals about 2 mm. long, glabrous except at the margin. Ovary with sparse hairs, 2-celled, many-ovulate. Petals glabrous, about 3 mm. long. Anthers orbiculate.

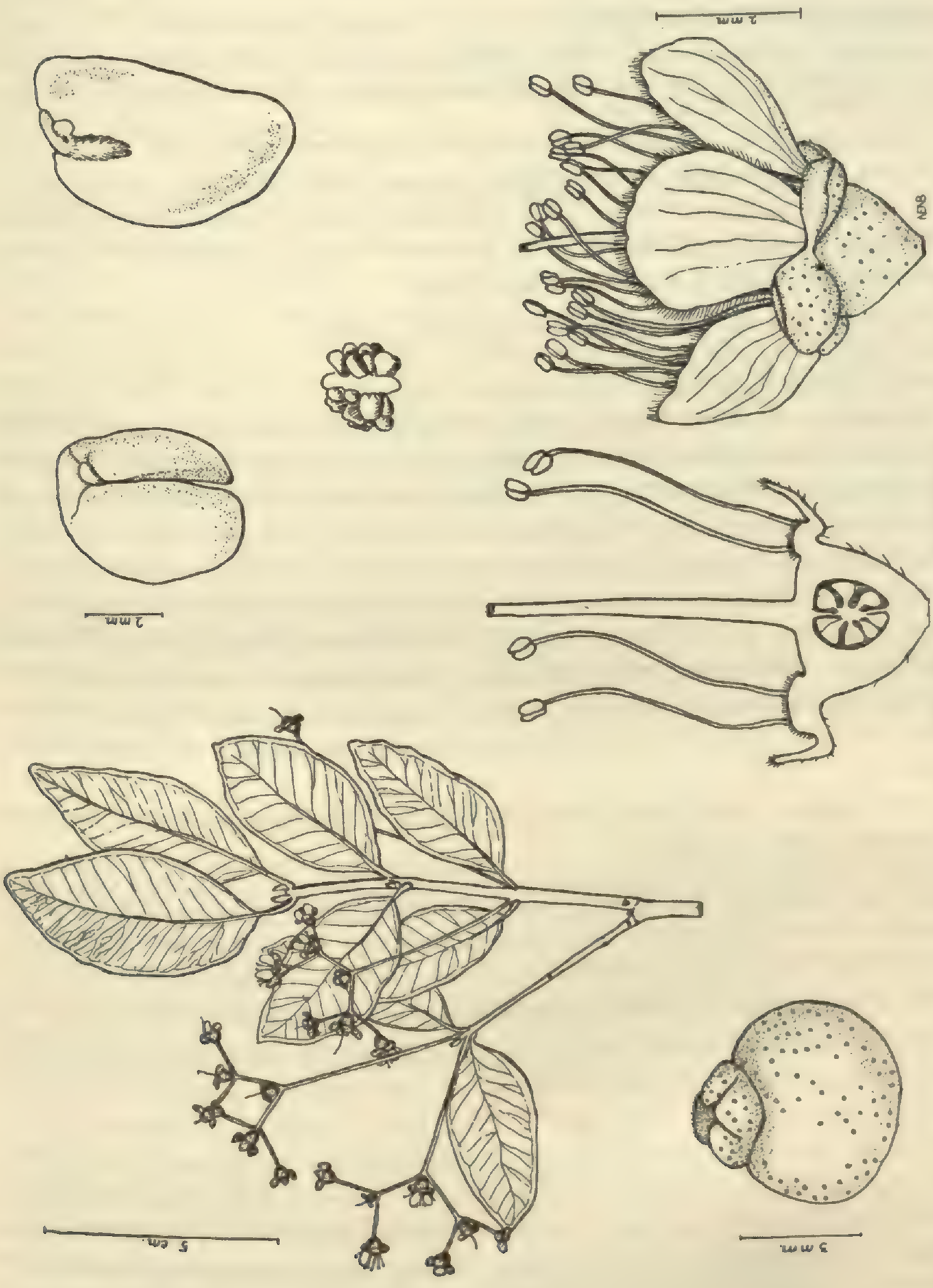

Fig. 56. *Eugenia fragrans*

Berry globose or ellipsoid, glabrous, orange, 1- or 2-seeded (or rarely more), 8 mm. long or larger. Cotyledons free with a short radicle between them.

West Indies and Central America. The Central American form is always with 4-merous flowers, the West Indian sometimes with 5-merous flowers. In Panama at altitudes of 1000 m. or more.

CHIRIQUÍ: outskirts of wood, Volcán de Chiriquí, *Seemann 1150*; Río Chiriquí Viejo valley, *G. White 108*, *P. White 217*, *211*; Boquete, *Davidson 460*, *774*, *821*, *1062*; vicinity of Cerro Punta, alt. 2000 m., *Allen 1563*.

Seemann 1150 was named *Eugenia arayan* by Seemann (Bot. Voy. Herald 125. 1852–59) in mis-association with *Myrtus arayan* HBK. Nov. Gen. & Sp. 6:133. 1823, a Peruvian plant. *Allen 1563* is a rather distinct looking specimen with suborbiculate, very rigid leaves with impressed nerves agreeing with *Eugenia rigidissima* Cuf. from a volcano in Costa Rica.

4. EUGENIA BIFLORA (L.) DC. Prodr. 3:276. 1828.

Myrtus biflora L. Syst. 1056. 1759.
Eugenia sericiflora Benth. Bot. Voy. Sulphur 89. 1844.

Shrubs 3–4 m. high; twigs terete, at first brown-tomentose intermixed with white hairs, later glabrate. Leaves lanceolate, acute at the base, long-acuminate and mucronate at the apex, up to 7 cm. long and 1.0–2.5 cm. wide, subcoriaceous or membranaceous, sparsely white-pilose on both sides, glabrescent, the midrib impressed above, prominent beneath, the lateral nerves numerous, inconspicuous on both sides. Inflorescence racemose, 3- to 7-flowered, tomentose. Flowers white. Bracts setaceous, 2 mm. long; bractlets also setaceous, longer than the ovary. Sepals ovate, apiculate, about 2 mm. long. Petals about 4 mm. long, sericeous outside. Ovary 2-celled, sericeous; ovules about 6–10 in each cell, arranged in a semicircle open above. Berry subglobose, 7 mm. long, smooth or faintly ribbed, edible.

The species is distributed throughout tropical America in several varieties. Vernacular name: *coralillo*.

COCLÉ: Penonomé and vicinity, *Williams 63*, *188*, *355*, *2776*. CHIRIQUÍ: Cerro Vaca, *Pittier 5316*. PANAMÁ: Taboga Island, *Maxon 6920*, *Macbride 2776*, *Barclay 977*, *Standley 27024*, *27886*, *29732*, *Miller 1843*, *2034*, *Pittier 3525*. VERAGUAS: Santiago de Veraguas, *Seemann 1149*.

5. EUGENIA NESIOTICA Standl. in Field Mus. Publ. Bot. 17:203. 1937.

Densely branched shrub flowering precociously while defoliated; young twigs grayish-puberulous, terete, densely foliate. Leaves elliptical-oblong, acute at the base, obtusely acuminate at the apex, 4–5 cm. long, 1–2 cm. wide, glabrous except the midrib, midrib prominulous above and prominent beneath, the veins finely reticulate on both sides; petiole about 2.5 mm. long. Flowers fasciculate, the pedicels white-pubescent, 5–6 mm. long. Sepals puberulous, about 2 mm. long, reflexed at anthesis. Petals orbicular, 3.5 mm. long. Ovary densely puberulous, 2-celled, the cells about 6-ovulate. "Berry resembling a huge cherry in color and texture, 2.5–3.0 cm. in diameter, the flesh about 0.5 cm. thick, the taste acid, edible. Seed single, sphaerical, covered with fibre (Zetek)."

Endemic. Vernacular name: *guayabillo.*

CANAL ZONE: Barro Colorado Island, *Zetek 3646, 3835, 3482, Starry 169, Standley 40987*; Obispo, *Standley 31712.*

This is one of the very few Myrtaceae in which the flowers develop before the leaves. The small reticulate leaves with the midrib elevated above characterize this species even when sterile. A species with rather similar leaves is *E. chepensis* Standl., in which the reticulation is more obscure and the marginal nerve single and very close to the margin.

6. EUGENIA PITTIERI Standl. in Field Mus. Publ. Bot. 8:145. 1930.

Slender shrubs 1.0–4.5 m. high; young twigs densely and minutely pubescent, densely foliate, the internodes 1.0–2.5 cm. long. Leaves more or less distichous, almost sessile. oblong to oblanceolate, acute at the base, obtusely acuminate at the apex, 4–6 cm. long, 1–2 cm. wide, membranous, glabrous except on midrib and margin, densely glandular-punctate, the midrib flat or slightly elevated above, prominulous beneath, the principal lateral nerves several but distant, diverging at an angle of about 60° with the midrib, delicate, the marginal nerve very close to the margin, the reticulation obscure throughout. Flowers minute, glomerate, few, axillary and lateral. Sepals nearly 1 mm. long. Petals obovate, 2 mm. long. Ovary glabrous, 2-celled, the cells 4- to 6-ovulate. Berry subglobose, sessile, 5–7 mm. long, red, crowned by the persistent sepals.

Panama and Costa Rica, at low altitudes.

PANAMÁ: banks of Mamoní R., below La Capitana, *Pittier 4484.*

The second Panamanian specimen cited by Standley, *Mrs. A. P. Epplesheimer s. n.* is a specimen of *Myrciaria floribunda.*

7. EUGENIA CHEPENSIS Standl. in Field Mus. Publ. Bot. 8:144. 1930.

Slender shrubs 2–3 m. high, the young twigs densely and minutely pubescent, densely foliate. Leaves more or less distichous, oblong or lanceolate-oblong, attenuate at both ends, up to 4.5 cm. long and 1–2 cm. wide, membranous, glabrous, the midrib flat or slightly elevated above, prominulous beneath, the lateral nerves several but distant, diverging at an angle of about 60° from the midrib, the marginal nerve very near the margin, the reticulation obscure throughout; petiole about 2 mm. long. Flowers axillary, in a 1- to 4-flowered abbreviated raceme, the peduncle and pedicels minutely pubescent, the pedicels slender, 4–10 mm. long. Petals not seen. Fruit a small globose berry, green to purple, about 6 mm. in diameter, crowned by the 4 persistent semi-orbiculate sepals.

Nicaragua and Panama, at low elevations.

CANAL ZONE: forest between Peluca Hydrographic Station and Quebrada Peluca, *Steyermark & Allen 17250*; forest between Quebrada La Palma and cañon of Río Chagres, *Dodge & Allen 17362*; upper Río Chilibre, *Seibert 1501*; Gatún, *Hayes 77, 236, 610*; Chagres, *Fendler 189*; without locality, *Hayes 255.* PANAMÁ: along Río Charara, near Chepo, *Pittier 4716.*

8. EUGENIA COSTARICENSIS Berg, in Linnaea 27:213. 1856.

Slender shrubs, the young twigs minutely pubescent, soon glabrate, densely foliate. Leaves more or less distichous, elliptical, acute at the base, obtusely acuminate at the apex, 3–4 cm. long and 1–2 cm. wide, chartaceous, glabrous, finely reticulate, the midrib impressed above and prominent beneath, the lateral nerves several but distant, delicate, the marginal nerve very near the margin; petiole slender, 4–6 mm. long, glabrous. Flowers in axillary 6- to 15-flowered fascicles, the pedicels slender, sparsely pubescent, 4–6 mm. long, the peduncle practically absent. Sepals 4, the larger about 1.5 mm. long. Petals suborbiculate, about 2.5 mm. long. Style glabrous. Ovary glabrous, many-ovulate. Berry not seen.

Costa Rica and Panama, at higher elevations, to 1900 meters.

VERAGUAS: locality unknown, *Warscewicz s. n.* (not seen).

In Berg's day, "Veraguas" included all of western Panama. From the description, this appears to be a very distinct species, but more recent collections have failed to include it.

9. EUGENIA ORIGANOIDES Berg, in Linnaea 29:229. 1858.

Eugenia banghamii Standl. in Journ. Arnold Arb. 11:125. 1930.

Shrubs or trees 2.5–6.0 m. high; twigs densely brown-pubescent with spreading hairs, glabrescent. Leaves elliptical to oblong, acute to rounded at the base, shortly acuminate at the apex, 5–10 cm. long and 2–5 cm. wide, at first pubescent on both sides, at length glabrate except on the midrib, the midrib scarcely impressed above, prominent beneath, the lateral nerves about 10 on each side, prominulous on both surfaces, passing into a marginal nerve at about 2–3 mm. distance from the margin; petiole robust, 3 mm. long, pubescent. Flowers glomerate, axillary, small, sessile or nearly so, white or pale yellow. Sepals ciliate, up to 1 mm. long. Petals obovate, 3 mm. long, glabrous. Ovary sparsely pubescent, 2-celled; cells about 5-ovulate. Berry globose, not more than 6 mm. in diameter, red to purplish-black, with thin juicy pericarp, 1-seeded.

Distribution: Mexico to Colombia.

CANAL ZONE: shores of Gatún Lake, south of Lab., *Bangham 488*; Ancón Hill, *Seibert 406*, *Woodson, Allen & Seibert 1318*, *Standley 26378, 29722*; Barro Colorado Island, *Shattuck 1043*, *Aviles s. n.* COCLÉ: Penonomé and vicinity, *Williams 214*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1727*; Llano Bonito, north of Las Margaritas, *Seibert 531*. PANAMÁ: in woods near Panamá, *Hayes 678*; San José Island, Perlas Archipelago, *Johnston 137, 387, 741, 779, 489*, *Erlanson 66*; near Punta Paitilla, *Standley 26275*; vicinity of Juan Franco Race Track, near Panamá, *Standley 27790, 27719*.

10. EUGENIA COLORADENSIS Standl. in Trop. Woods 52:27. 1937.

Eugenia melanosticta Standl. in Journ. Arnold Arb. 11:126. 1930, non Koorders & Valeton.

Glabrous shrubs or trees. Leaves oblong, or elliptical- to obovate-oblong, acute at the base, shortly and acutely acuminate at the apex, 8–17 cm. long, about 7.5 cm. wide, quite variable in size, membranaceous to coriaceous, glabrous, the midrib

impressed above, prominent beneath, the lateral nerves in about 10 pairs, inconspicuous above, prominulous beneath, arcuate, anastomosing near the margin. Inflorescences axillary, few-flowered, racemose, the racemes often gathered into a panicle, the rachis and the pedicels rather robust, the pedicels 4–7 mm. long. Sepals semi-orbiculate, unequal, the larger up to 2.5 mm. long. Petals oblong, nearly 7 mm. long. Ovary glabrous, 2-celled; ovules about 4–5 in each cell, pendulous. Berry ovoid-globose, 10–12 mm. long, crowned by the conspicuous sepals.

Costa Rica and Panama. Known as *guayabito de monte.*

CANAL ZONE: Lion Hill station, *Hayes s. n.*; Barro Colorado Island, *Aviles 21, Shattuck 1118, Bangham 445, Salvoza 909, Zetek 4568.*

Perhaps not distinct from the following:

11. EUGENIA OERSTEDEANA Berg, in Linnaea 27:285. 1856.

(?) Eugenia balancensis Lundell, in Phytologia 1:481. 1941.

Glabrous trees; twigs slender, much branched. Leaves ovate or oblong, acute at the base, long-acuminate at the apex, 4–8 cm. long and 2–4 cm. wide, membranaceous, glabrous, the midrib impressed above, prominent beneath, the lateral nerves up to about 12 pairs, delicate, inconspicuous, arcuate-anastomosing at about 2–4 mm. from the margin; petiole about 4 mm. long. Racemes glabrous or minutely puberulous, axillary, sometimes the flowers partly solitary, the fully developed racemes 7- to 11-flowered, the rhachis 2–3 cm. long, the pedicels filiform, 3–5 (–10) mm. long, the uppermost flower usually sessile. Flowers white, small. Sepals up to 1.5 mm. long. Petals 3 mm. long, not covered by the calyx in the bud. Ovary glabrous, 1 mm. high. Berry globose, 1-seeded, crowned by the small calyx.

Mexico, Costa Rica and Panama, in shady forests. Vernacular name: *sequarra.*

CANAL ZONE: in forest near the northerly arm of Quebrada Salamanca, *Steyermark & Allen 17149*; Río Paraíso, *Standley 29853*; Darién station, *Standley 31596.* CHIRIQUÍ: Progreso, *Cooper & Slater 158.* PANAMÁ: in woods near the Hacienda de Juan Lanas, *Seemann 476*; Bojio station, *Hayes 600*; in woods near Manuel station, *Hayes s. n.*

Closely allied to the preceding species, but apparently more slender in all parts and with smaller flowers and leaves.

12. EUGENIA SP.

Shrubs or small trees about 4 m. high. Leaves oblong, rounded at base, obtuse at apex, 20.0–26.5 cm. long and about 10 cm. wide, coriaceous, glabrous, discolorous, the midrib flat above, prominent beneath, the lateral nerves numerous, the principal ones in about 20 pairs, prominulous, the lesser ones prominulous above and obsolete beneath; petiole about 5 mm. long. Flowers apparently lateral, fasciculate, possibly sessile. Berry oblong, tomentose, about 2 cm. long and 1 cm. broad, crowned by 4 rounded sepals up to 3 mm. long.

DARIÉN: Paca, just below Cana, *Williams 701.*

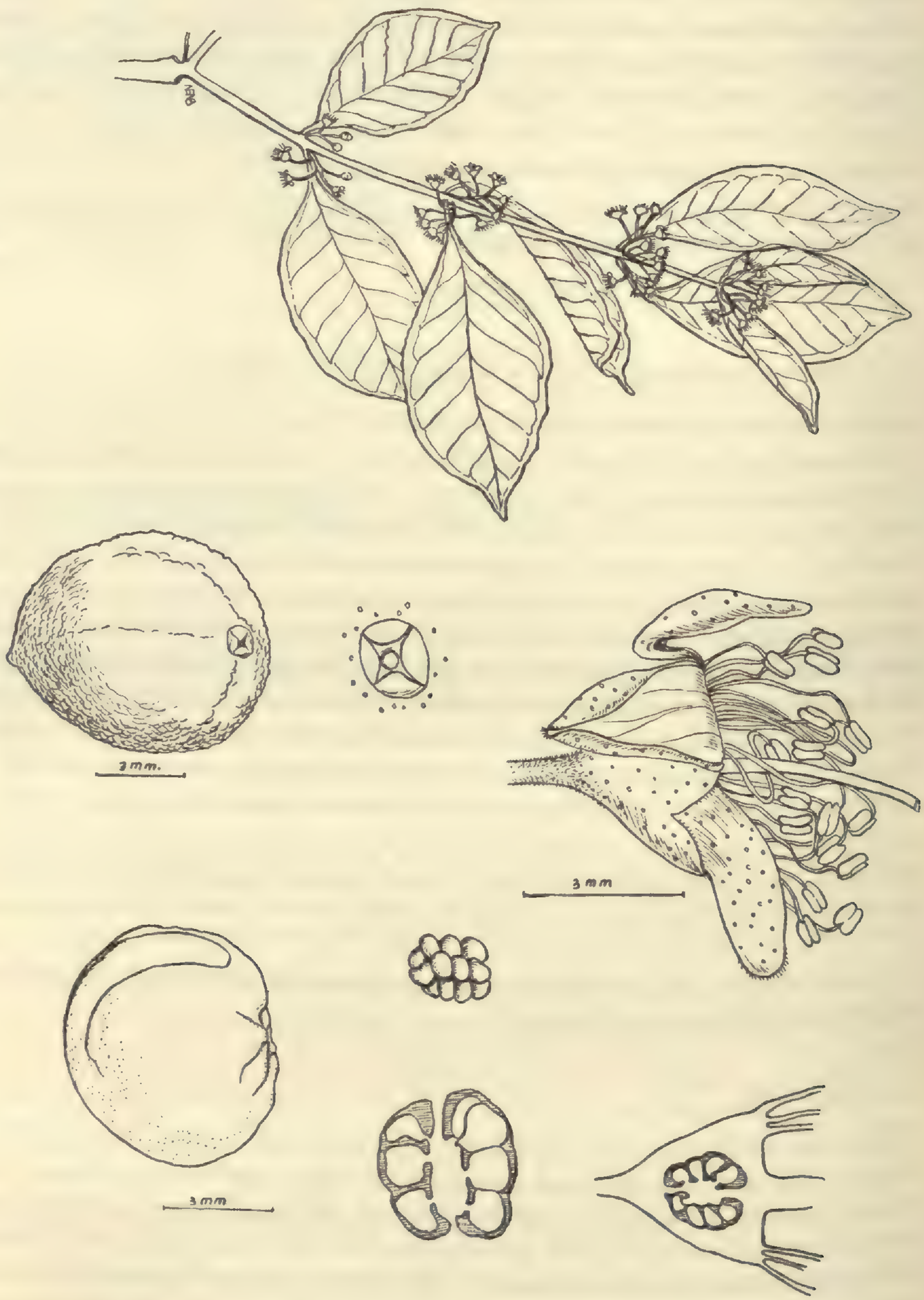

Fig. 57. *Eugenia acapulcensis*

Although quite distinct in appearance, the material presently available is insufficient for the purpose of formal designation.

13. EUGENIA ACAPULCENSIS Steud. Nomencl. Bot. 1:601. 1840.

Myrtus maritima HBK. Nov. Gen. & Sp. 6:146. 1823.
Eugenia maritima (HBK.) DC. Prodr. 3:282. 1828, non *E. maritima* DC. loc. cit. 3:271. 1828.
Eugenia colipensis Berg, in Linnaea 29:243. 1858.
(?) Eugenia cartagenensis Berg, loc. cit. 1858.
Eugenia antiquae Riley, in Kew Bull. 1927:121. 1927.

Shrubs or trees 3–12 m. high, with glabrous twigs. Leaves elliptic, rarely oblong or lanceolate, acute or attenuate at the base, shortly and obtusely acuminate at the apex, 5–12 cm. long and 2–6 cm. wide, glabrous but densely glandular-punctate, the midrib slightly impressed above, prominent beneath, the lateral nerves distant, in 6–9 pairs, prominulous on both surfaces, the lower ones curved at their base, passing into a marginal nerve at about 1–3 mm. distance from the margin; petiole up to 1 cm. long. Flowers green or white, very small, in numerous axillary abbreviated racemes, the rachis up to 1 cm. long though often much shorter (in the latter case perhaps accrescent during fruiting), the pedicels filiform, glabrous or puberulous. Ovary glabrous. Sepals 4, very short and scarcely 1 mm. long, semi-orbiculate. Petals densely glandular-punctate, about 3 mm. long. Berry globose, dark red to black (or sometimes yellow?), about 8 mm. in diameter, crowned with the very small connivent sepals. Embryo homogeneous.

A polymorphic species distributed throughout Central America. In Panama it seems to be the most common Myrtacea, on the Pacific coast especially frequent. Possibly extending to Colombia and scarcely distinguishable from some forms of the West Indian *E. axillaris* (Sw.) Willd. *Eugenia cartagenensis* Berg, described from Costa Rica, is apparently nothing more than a small-leaved *E. acapulcensis*, although with ovoid fruit (always?). The latter form is represented in Panama by *Williams 58* and *Allen 2516* from Coclé, but with globose fruits. *Eugenia antiquae* Riley was described from a Panama specimen, and that name must be used in Panama if several species are recognized. Vernacular name in Panama: *paico*.

CANAL ZONE: vicinity of Miraflores Lake, *P. White 108, 118, G. White 147, Allen 1712*; Chagres, *Fendler 183*. CHIRIQUÍ: Finca Lérida, *Woodson & Schery 210*. PANAMÁ: savana east of Pacora, *Woodson, Allen & Seibert 726*; Isla Taboga, *Woodson, Allen & Seibert 1483*; hills above Campana, *Allen 1324*; Old Panamá, *Riley 142*; Sabanas, Panamá, *Riley 110*; El Jagua Hunting Club on Río Jagua and Congor Hill, *Hunter & Allen 478*; Trapiche Island, *Allen 2631*; Saboga Island, *Miller 1955*; San José Island, *Johnston 727, 734, 736, 748*.

14. EUGENIA HIRAEIFOLIA Standl. in Field Mus. Publ. Bot. 17:202. 1937.

Shrubs or trees. Leaves obovate, cuneate toward the base, obtuse or subtruncate and very shortly apiculate at the apex, 12–14 cm. long and 6–8 cm. wide, glabrous, the midrib impressed above and prominent beneath, the lateral nerves straight, in about 8–11 pairs, arcuate-anastomosing at some distance from the

margin but for the greater part straight, ascending, nearly obsolete above, prominent beneath; petiole robust, about 7 mm. long. Inflorescence (imperfectly known) apparently cymose, 3-flowered; peduncle robust, about 2 cm. long. Flowers not known. Berry large, obovoid, 1-seeded, about 2.5 cm. long and 1 cm. broad, crowned by the persistent 4-merous calyx. Embryo homogeneous.

Endemic. A rather distinct but still imperfectly known species. The leaves, by their venation, are strongly suggestive of a *Psidium*.

PANAMÁ: Monte Obscuro, near Panamá City, *Zetek 3550*.

A deflorated specimen collected by Davidson (no. *439*) in Chiriquí Province, near Bajo Chorro, comes near *E. hiraeifolia*, but seems distinct by the definitely acuminate leaves, the fasciculate inflorescences which are mixtures of 1-flowered pedicels and one or two few-flowered racemes, and larger sepals up to 5 mm. long.

15. EUGENIA SALAMANCANA Standl. in Ann. Missouri Bot. Gard. 26:295. 1939.

Trees up to 6 m. high, the twigs terete, at first densely brown-pubescent, soon glabrate. Leaves oblong or elliptical-oblong, rounded and shortly caudate-acuminate at the apex, narrowly rounded toward the base, 7–9 cm. long and 2.5–4.0 cm. wide, concolorous, glabrous with the exception of the midrib, the midrib slightly impressed above, prominent beneath, the lateral nerves about 12 on each side, obscure, the veins obsolete. Flowers probably sessile, solitary or in clusters of few, lateral on the lower defoliated part of the twigs. Mature flowers and fruit not known.

Endemic. An imperfectly known species.

CANAL ZONE: vicinity of Salamanca Hydrographic Station, Río Pequení, alt. 80 m., *Woodson, Allen & Seibert 1570*.

16. EUGENIA TAPACUMENSIS Berg, in Linnaea 27:222. 1856.

Eugenia ochra Berg, loc. cit. 216. 1856.
Eugenia roraimana Berg, loc. cit. 219. 1856.

Subglabrous shrubs or small trees up to 10 m. high. Leaves ovate- to elliptical-oblong, obtuse or shortly and obtusely acuminate at the apex, obtuse or acute at the base, 5–15 cm. long and 4–7 cm. wide, chartaceous to coriaceous, glabrous, the midrib impressed or sulcate above, prominulous toward the base below, the lateral nerves about 12–14 on each side, oblique, prominulous on both sides, arcuate-anastomosing into a marginal nerve 2–3 mm. within the margin; petiole 4–10 mm. long. Flowers mostly borne on the defoliated branchlets, pink or white, in short racemes or fascicles of 2–15, subglabrous, the rachis if well developed up to 8 mm. long, the pedicels 3–5 mm. long. Calyx waxen-white, the sepals rounded, glabrous, ciliate, about 1 mm. long, even in the bud much shorter than the petals. Petals chartaceous, orbiculate, about 5 mm. long. Ovary globose, glabrous, 2-celled; placenta peltate; ovules about 15 in each cell. Berry subglobose, black, when dry about 1 cm. in diameter; testa of seeds shiny; embryo undivided.

Panama to the Guianas and Peru; West Indies (Martinique, St. Vincent).

CANAL ZONE: Río Grande railway station, *Hayes 344*. PANAMÁ: in woods near Panamá, *Hayes s. n.*

It is odd indeed that no more recent records of this species are available.

17. EUGENIA OCTOPLEURA Krug & Urban, in Engl. Bot. Jahrb. 19:653. 1895.

Shrubs 3–5 m. high, the young twigs very shortly pubescent at their tips with dibrachiate hairs, soon glabrate. Leaves elliptical or elliptical-oblong, acute at the base, obtusely acuminate at the apex, 7–13 cm. long and 4–5 cm. wide, coriaceous, glabrous, the midrib impressed above, prominent beneath, the lateral nerves in about 12 pairs, obsolete above, prominulous beneath; petiole 8–10 mm. long. Inflorescence shortly racemose, 2- to 8-flowered, as long as the petiole or somewhat shorter, sparsely sericeous; pedicels 4–8 mm. long. Flowers 4-merous. Sepals unequal, the 2 outer orbiculate, 2.5–3.0 mm. long, the 2 inner 1.0–1.5 mm. long. Petals obovate, 3–4 mm. long. Ovary obconic, pubescent outside but glabrescent, 2-celled; ovules 12–18 in each cell, inserted on a peltate placenta. Berries obovate-oblong, distinctly 8-ribbed, up to 1.5 cm. long.

Lesser Antilles (Guadeloupe, Martinique, and Dominica) and Panama.

CANAL ZONE: Maumey station, Panamá Railroad, *Hayes 577*.

18. EUGENIA AUSTIN-SMITHII Standl. in Field Mus. Publ. Bot. 18:1561. 1938.

Trees with slender glabrous twigs. Leaves elliptical-oblong to ovate-oblong, acute at the base, acuminate at the apex, 6–7 cm. long and 2.5–3.5 cm. wide, coriaceous, glabrous, the midrib impressed above, prominulous beneath, the lateral nerves about 12 on each side, prominulous on both surfaces; petiole canaliculate, up to 8 mm. long. Flowers mostly cauliflorous; pedicels robust, up to 1 cm. long. Flower buds pear-shaped, the sepals enclosing the petals. Sepals greenish, rounded, reflexed at anthesis, thick, unequal, the 2 inner up to 5 mm. long, the 2 outer nearly 3 mm. long. Petals white, about 7 mm. long. Ovary obconoid, glabrous or with a few hairs, 2-celled, about 3 mm. high, the cells about 12-ovulate. Berry said to be oblong or globose, deep crimson, about 2.0–2.5 cm. in diameter.

Originally described from Costa Rica, in dry woods at medium altitudes. No specimens from Panama have been seen by the writer, but it is to be expected in the highlands of western Panama.

19. EUGENIA CHRYSOPHYLLUM Poir. in Lam. Encycl. Suppl. 3:129. 1813.

Eugenia cricamolensis Standl. in Field Mus. Publ. Bot. 4:242. 1929.

Shrubs or trees; young twigs brown-tomentose, soon glabrate. Leaves oblong to lanceolate-oblong, long acuminate at the apex, acute at the base, 7–15 cm. long and 3–5 cm. wide, chartaceous to coriaceous, the young leaves densely golden brown-sericeous on both sides, soon glabrescent above, with hairs closely appressed, the adult leaves discolorous, glabrate above and paler and appressed-pubescent beneath, the midrib flat, prominulous toward the apex above, prominent beneath, the lateral nerves in about 12–16 pairs, prominulous on both sides; petiole 3–7 mm.

long. Flowers fasciculate or shortly racemose (the rachis up to 5 mm. long), in clusters of 3–8, axillary; pedicels 2–7 mm. long, brown-tomentose; bractlets minute, narrow. Sepals tomentose, very unequal, the 2 outer suborbiculate, about 1.5 mm. long, the 2 inner ovate, about 3 mm. long. Petals obovate or oblong, about 5 mm. long, glandular. Ovary tomentose, 2-celled, many-ovulate. Berry ellipsoid, about 15 mm. long and 9–12 mm. wide in our specimens (up to 2.5 cm. in diameter according to Cooper), grayish-puberulent, 1-seeded, the embryo homogeneous.

Surinam and French Guiana, otherwise known only from the following specimen from Panama. The Panamanian specimen has fewer lateral leaf-nerves than those of the Guianas (12 instead of 16) and also perhaps larger fruits, but otherwise the populations appear to be conspecific. Vernacular name: *cacique.*

BOCAS DEL TORO: region of Almirante, Cricamola valley, *Cooper 511.*

20. EUGENIA OREINOMA Berg, in Linnaea 27:158. 1856.

Small trees 4–5 m. high, the trunk with grayish, exfoliating bark; young twigs and petioles densely pubescent. Leaves ovate or broadly elliptical, rounded or obtuse at the base, shortly acuminate at the apex, 9–12 cm. long and 4.5–6.0 cm. wide, reticulate-veined, sparsely pubescent but glabrescent above, densely pubescent with patent hairs beneath, especially on the nerves, the midrib flat above, prominent beneath, the lateral nerves in about 8 pairs, arcuate-anastomosing at some distance from the margin, prominulous above, prominent beneath; petiole robust, about 5 mm. long, pubescent. Flowers fasciculate but occasionally solitary, the pedicels about 1 cm. long, pubescent. Flowers not known. Fruit globose, usually densely pilose, 1-seeded, about 4 mm. long, black or purplish, crowned by 4 persistent, striate sepals.

Costa Rica and Panama. Vernacular names: *icaquillo, sortija.*

CHIRIQUÍ: Sabana de la Tortuga, between El Boquete and Caldera, alt. 300–700 m., *Pittier 3297.*

7. CALYCOLPUS Berg

CALYCOLPUS Berg, in Linnaea 27:378. 1856.

Trees or shrubs. Inflorescences axillary, usually 1-flowered, rarely 3-flowered, singly or in fascicles of 2–5, at the tips of extremely abbreviate, minutely bracteate shoots; bracteoles very small, paired at the base of the ovary; flowers 5-merous. Sepals large and persistent, coriaceous-foliaceous, patent in the bud. Receptacle not produced above the ovary. Petals obovate, large. Stamens numerous, the anthers linear-oblong, dorsifixed near the base, dehiscing longitudinally. Ovary 3- to 6-celled, many-ovulate; placentas 2-lobed; ovules oblong. Berry subglobose, many-seeded. Seeds hippocrepiform, yellowish white, one side with a blackish spot, shining, finely reticulate, hard. Embryo incurved, the radicle elongate, the cotyledons very small.

Species about 7 in tropical America.

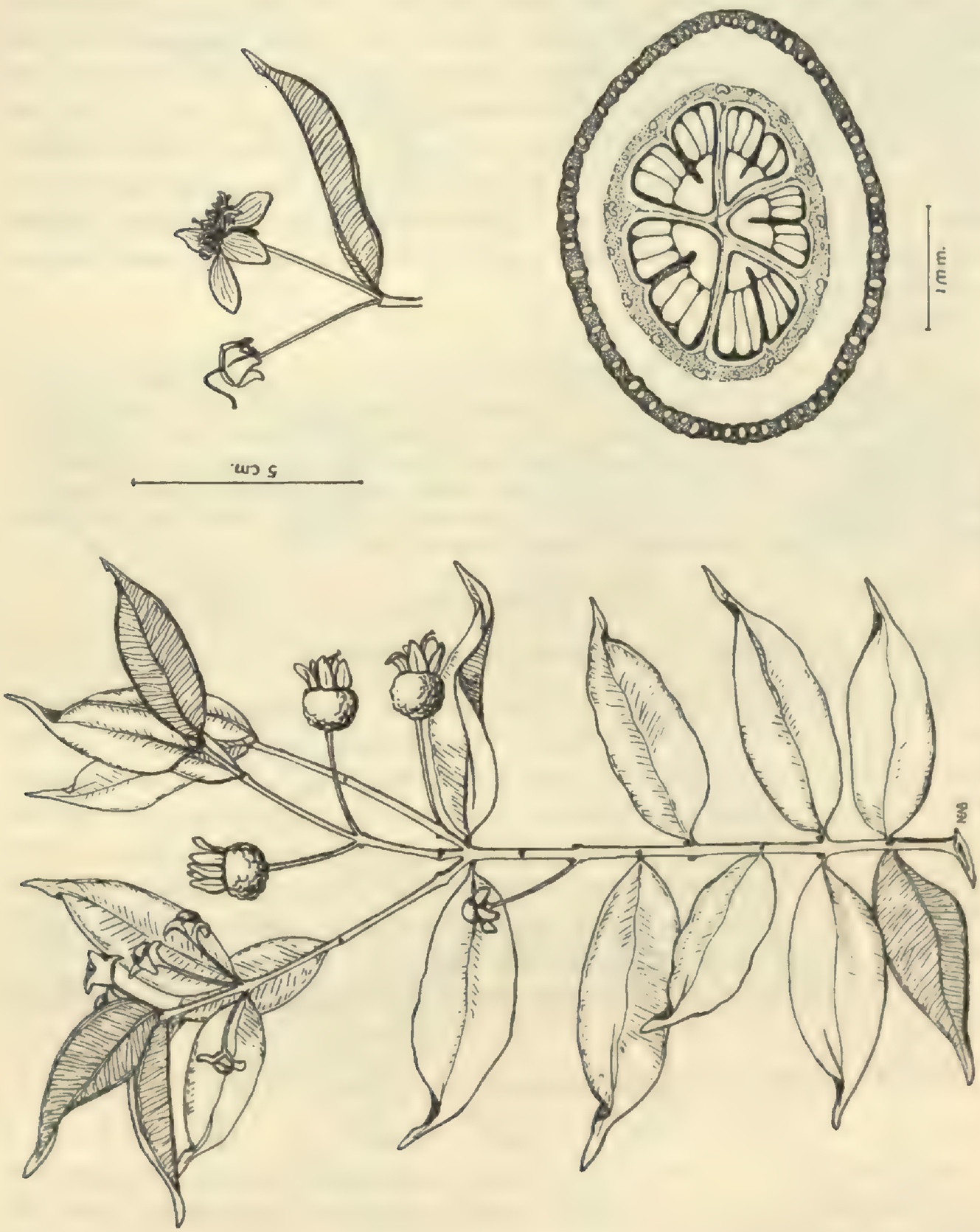

Fig. 58. *Calycolpus warszewiczianus*

1. CALYCOLPUS WARSZEWICZIANUS Berg, in Linnaea 27:382. 1856; Riley, in Kew Bull. 1926:153. 1926.

Glabrous shrubs or small trees up to 7 m. high, with exfoliating bark; twigs subterete or faintly angled. Leaves ovate- or elliptical-oblong, obtuse or acute at the base, acutely acuminate at the apex, 3–8 cm. long and 1.5–3.0 cm. wide, firmly membranaceous to subcoriaceous, glabrous, the midrib impressed above and prominent beneath, the lateral nerves delicate, numerous, prominulous on both sides; petiole up to 3 mm. long. Peduncles glabrous, axillary, 1.5–3.0 cm. long, mostly single; bractlets linear to oblong, 1–3 mm. long; flowers white to pinkish, fragrant. Sepals oblong, obtuse, accrescent, 5–10 mm. long, with distinct midnerve. Petals obovate-oblong, about 1.5 cm. long. Ovary subglobose, glabrous. Berry subglobose, up to 1 cm. long, crowned with the large accrescent disc and persistent sepals.

Panama and Costa Rica.

CANAL ZONE: along banks of Quebrada la Palma and Cañon of Río Chagres, *Dodge & Allen 17339*; vicinity of former town of Empire, *Hunter & Allen 770*; Chagres, *Fendler 105*; Barro Colorado Island, *Wilson 79, Aviles 26, Wetmore & Abbe 171, Woodworth & Vestal 489, Bangham 454*; island in Gatún Lake, *Ostenfeld 104*. COCLÉ: Penonomé and vicinity, *Williams 2, 220*. PANAMÁ: hills near Capira, *Dodge & Hunter 8642*; Pacora, *Bro. Paul 422*; between Las Sabanas and Matías Hernández, *Standley 31870*; San José Island, *Erlanson 60*; in meadows near city of Panamá, *Seemann 282*.

8. UGNI Turcz.

UGNI Turcz. in Bull. Soc. Nat. Moscow 21:579. 1848.

Low much branched and densely foliate shrubs. Leaves opposite or subopposite, small. Peduncles axillary, 1-flowered. Flowers medium-sized, 4- or 5-merous. Sepals patent in the bud, longer than the imbricated petals. Petals firm. Stamens numerous, unequal; filaments straight or hardly curved even in the bud, short and flat; anthers basifixed, 2-celled, dehiscing longitudinally, introrse. Ovary 3- to 5-celled; cells several-ovulate; placenta central. Berry several-seeded; seeds hippocrepiform, with a hard and shining testa with a black spot at one side; embryo incurved; radicle elongate; cotyledons very short.

About 15 species of high altitudes, from southern Chile to Guatemala and Venezuela.

1. UGNI WARSCEWICZII Berg, in Linnaea 27:390. 1856.

Eugenia warscewiczii (Berg) Hemsl. Biol. Centr. Amer. Bot. 1:411. 1880.

Low densely foliate shrubs 2–3 m. high, the branches glabrous, the internodes on the defoliated parts of the twigs marked by the scars of the fallen leaves, the innovation shoots more or less pubescent. Leaves oblong or elliptical-oblong, acute at both ends, up to 15 mm. long and 8 mm. wide, coriaceous, glabrous, more or less impressed-punctate, the midrib impressed above, prominent beneath, the venation obsolete. Pedicels recurved, up to 1 cm. long, pubescent; bractlets linear, ciliate, persistent, longer than the ovary, about 6 mm. long. Sepals lanceolate, obtusish,

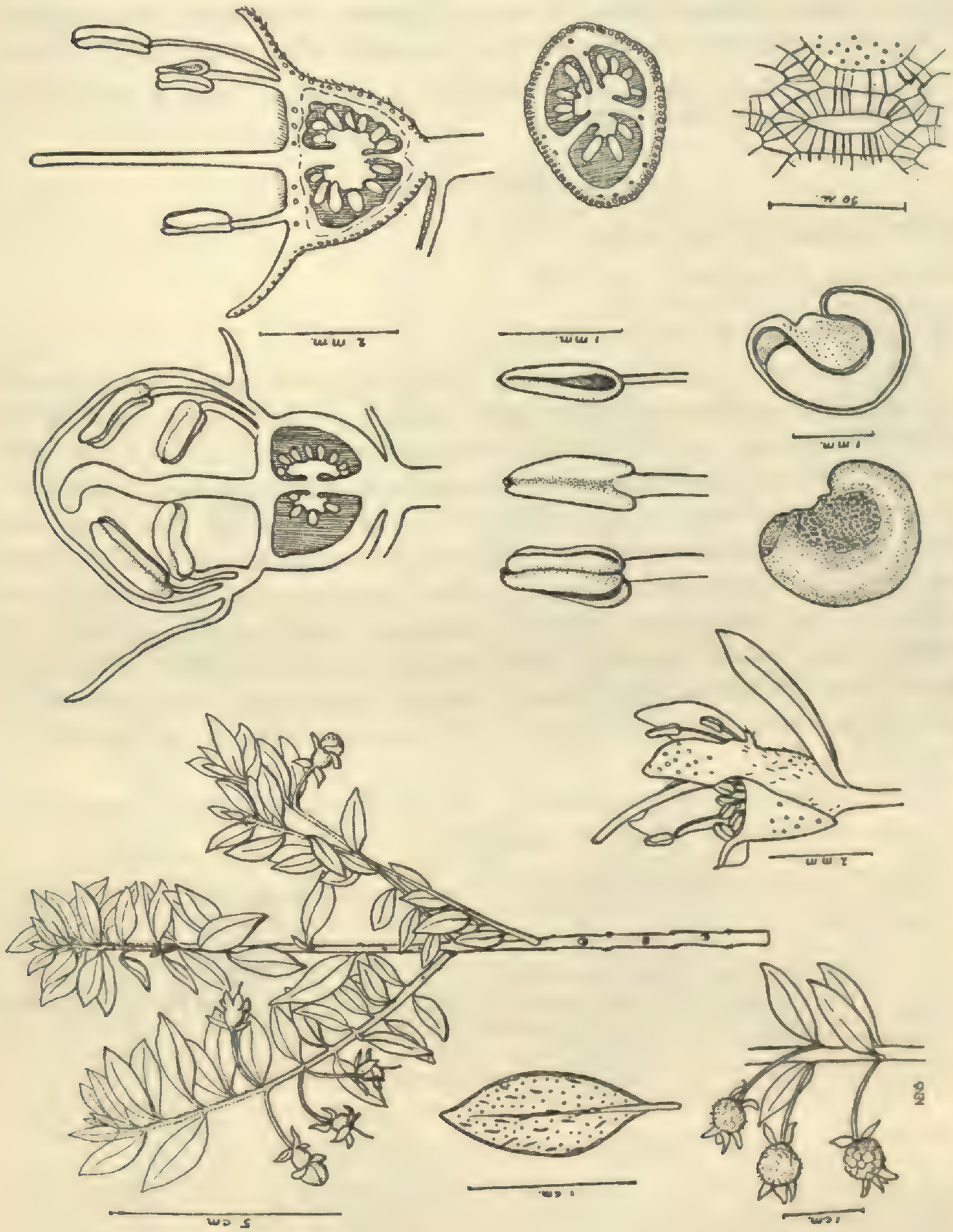

Fig. 59. *Ugni warscewiczii*

about 5 mm. long. Petals obovate, about as long as the sepals. Anthers of the outer stamens lanceolate, acutish, crowned by an apical gland, the anthers of the inner shorter stamens ovate, truncate, without glands; filaments flattened. Ovary glabrous or sparsely pubescent, 3- to 4-celled; ovules inserted on a peltate central placenta. Berry depressed-globose, 8 mm. in diameter, bluish black, several-seeded.

Endemic to Panama. *U. oerstedii* Berg is a closely allied species of Costa Rica.

CHIRIQUÍ: Volcán de Chiriquí, alt. 2500–4000 m., *Woodson, Allen & Seibert 1066, Woodson & Schery 439, Pittier 3075.*

9. PSIDIUM L.

PSIDIUM L. Spec. Pl. 470. 1753.

Guiava [Tourn.] Adans. Fam. 2:88. 1763.
Acca Berg, in Linnaea 27:138. 1856.
Calyptropsidium Berg, loc. cit. 349. 1856.

Shrubs or trees. Leaves opposite or subalternate, the lateral nerves mostly ascending, arcuate-anastomosing without forming a distinct marginal nerve. Inflorescence cymose, 1- to 7-flowered; peduncles in the axils of the lower often bract-like leaves of lateral branchlets. Flowers large or medium-sized. Receptacle produced above the ovary. Calyx closed in the bud or open and then truncate or 5-lobed, at anthesis irregularly 3- to 5-fid, sometimes at length irregularly circumscissile. Petals 5, orbiculate or obovate, white. Stamens numerous, the filaments incurved in the bud; anthers dorsifixed, dehiscing longitudinally. Ovary 2- to 7-celled, many-ovulate; placenta 2-lamellate; ovules in a single or triple row; stigma capitate or peltate. Berry mostly globose, many-seeded; seeds embedded in pulp, the testa dull, hard. Embryo incurved; radicle elongated; cotyledons very short.

Species about 60 in tropical America. A few species are cultivated throughout the tropics of the world for their edible fruits.

1a. Calyx open in the bud; leaves small, subsessile..... 1. Ps. SALUTARE
b. Calyx closed in the bud; leaves shortly petiolate.....2
2a. Plants glabrous. 3
b. Plants pubescent. 4
3a. Leaves 2.5–5.0 cm. long; young twigs subterete..... 2. Ps. SARTORIANUM
b. Leaves 8–12 cm. long; young twigs narrowly 4-angled..... 3. Ps. FRIEDRICHSTHALIANUM
4a. Leaves usually with 12 or more pairs of close parallel lateral nerves impressed above; young twigs 4-angular..... 4. Ps. GUAJAVA
b. Leaves usually with 7–10 pairs of remote arcuate nerves not impressed above; young twigs compressed or subterete..... 5. Ps. GUINEENSE

1. PSIDIUM SALUTARE (HBK.) Berg, in Linnaea 27:356. 1856.

Myrtus salutaris HBK. Nov. Gen. & Sp. 6:105. 1823.
Psidium ciliatum Benth. in Hook. Journ. Bot. 2:318. 1840.
Psidium oerstedeanum Berg, in Linnaea 27:360. 1856.
Calycolpus parviflorus Sagot, in Ann. Sci. Nat. ser. 6. 20:181. 1885.
Psidium gentlei Lundell, in Amer. Midl. Nat. 29:483. 1943.

Undershrub often less than 1 m. high, simple and sparingly branched or with several stems; twigs compressed, puberulous or glabrous. Leaves subsessile, ovate

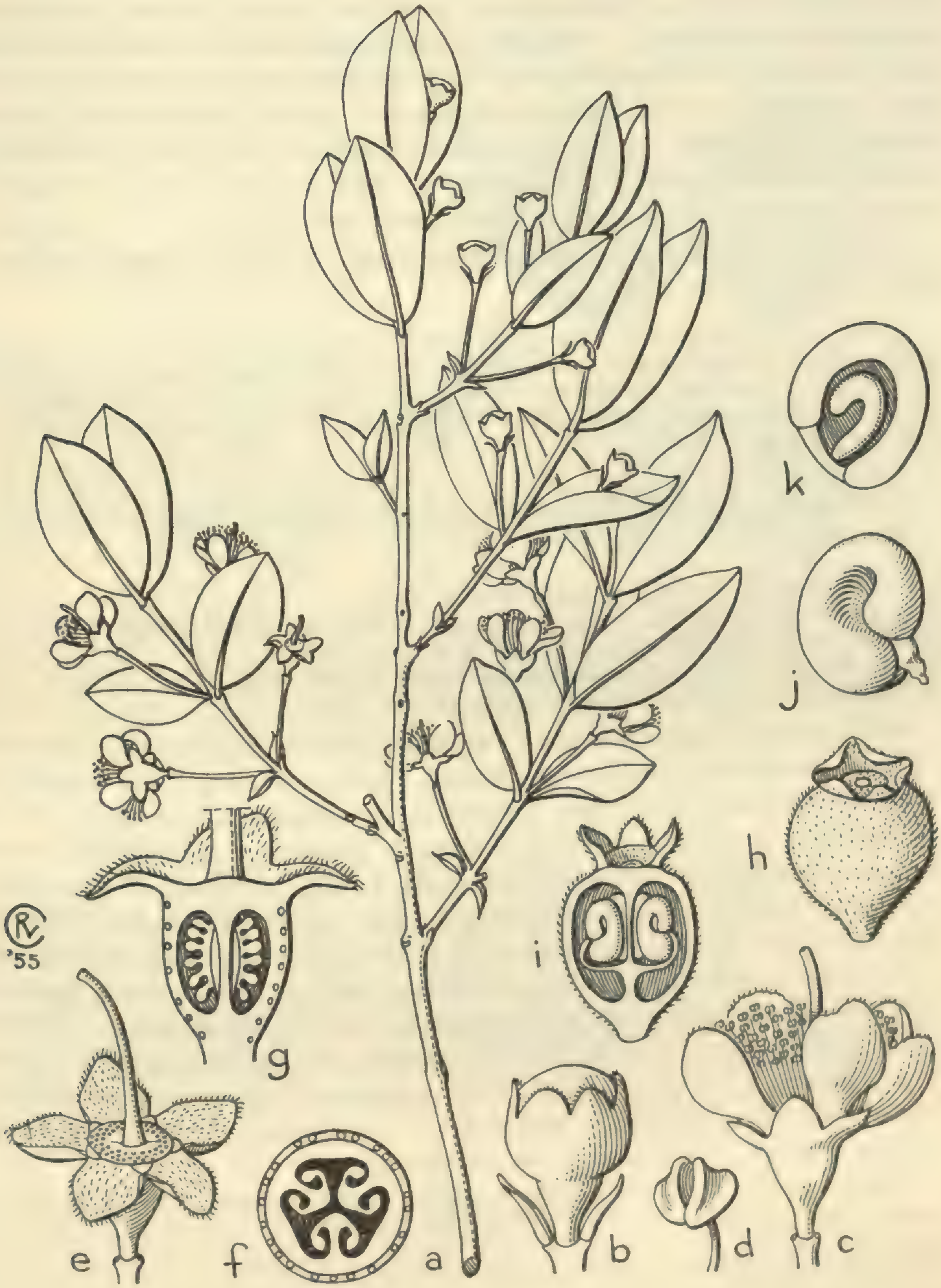

Fig. 60. *Psidium salutare*

to elliptical-oblong, rounded or obtuse at the base, acute at the apex, up to 6 cm. long and 2 cm. wide, coriaceous, at first more or less puberulous, later glabrate, the midrib elevated on both sides or nearly flat above, the lateral nerves in about 6 pairs, arcuate-ascending, prominulous on both sides; petiole obsolete, often with 2 minute setaceous stipules. Peduncles 1–3 cm. long, solitary, axillary, 1-flowered. Calyx open in the bud, later 5-fid to the base, the lobes rounded or obtusish. Petals about 7 mm. long. Anthers suborbiculate, cordate. Ovary puberulous or glabrous, obconoid, 2 mm. high; placenta 2-lamellate; ovules in a single or double row at each side of the placenta. Berry subglobose, when dry about 1 cm. in diameter, said to be about as large as a cherry and of good flavor.

Honduras and El Salvador to the Amazon basin. Vernacular names: *guayabito arrayán*; *guayabito del Perú*.

CANAL ZONE: Ancón Hill, *Piper 5535*, *Standley 25208*, *26340*. CHIRIQUÍ: Boquete District, *Davidson 835*; Sabana de la Tortuga, between El Boquete and Caldera, *Pittier 3300*. COCLÉ: Penonomé and vicinity, *Williams 211*. PANAMÁ: hills northeast of Hacienda La Gorga, 50–300 m., *Dodge, Hunter & Steyermark 16899*, *Dodge, Hunter, Steyermark & Allen 8751*.

2. PSIDIUM SARTORIANUM (Berg) Ndz. in Engl. & Prantl, Nat. Pflanzenfam. 3^7: 69. 1893.

Mitranthes sartorianum Berg, in Linnaea 29:248. 1858.
Calyptropsidium sartorianum (Berg) Krug & Urb. in Engl. Bot. Jahrb. 19:581. 1895.
Calyptranthes tonduzii Donn. Sm. in Bot. Gaz. 23:245. 1897.
Mitropsidium sartorianum (Berg) Burret, in Notizbl. 15:487. 1941.
Psidium solisii Standl. in Field Mus. Publ. Bot. 23:133. 1944.

Shrubs or small trees, sometimes 15 m. high, the bark gray, smooth, in all parts glabrous or nearly so; young twigs subterete. Leaves petiolate, ovate, rounded or obtuse to nearly acute at the base, acute or acutely acuminate at the apex, 2.5–5.0 cm. long and up to 2.5 cm. wide, coriaceous, glabrous, the midrib flat above, prominent beneath, the lateral nerves in about 6 pairs, ascending, obsolete above, prominulous beneath; petiole about 3 mm. long, slender. Peduncles 1-flowered, 1.0–1.5 cm. long, slender. Calyx closed in the bud, later irregularly splitting with 1 large more or less lid-like deciduous segment and 2–3 other minute persistent segments.[1] Petals rounded, about 4 mm. long, ciliate, early-deciduous. Anthers ovate. Ovary glabrous, usually 3-celled; placenta 2-lamellate; ovules in a single row at each side of the placenta. Fruit subglobose, 1.5–2.0 cm. in diameter, greenish yellow, several-seeded; seeds angular, concolorous. Embryo coiled with less than 2 spirals, embedded in a coarse-celled pulp.

Mexico to Panama, apparently becoming rarer toward the south; Cuba. *Arrayán, guayabillo.*

PANAMÁ: San José Island, *Johnston 486*.

[1] The accompanying drawing, with neatly circumscissile calyx, is somewhat misleading; such abscission is exceptional.

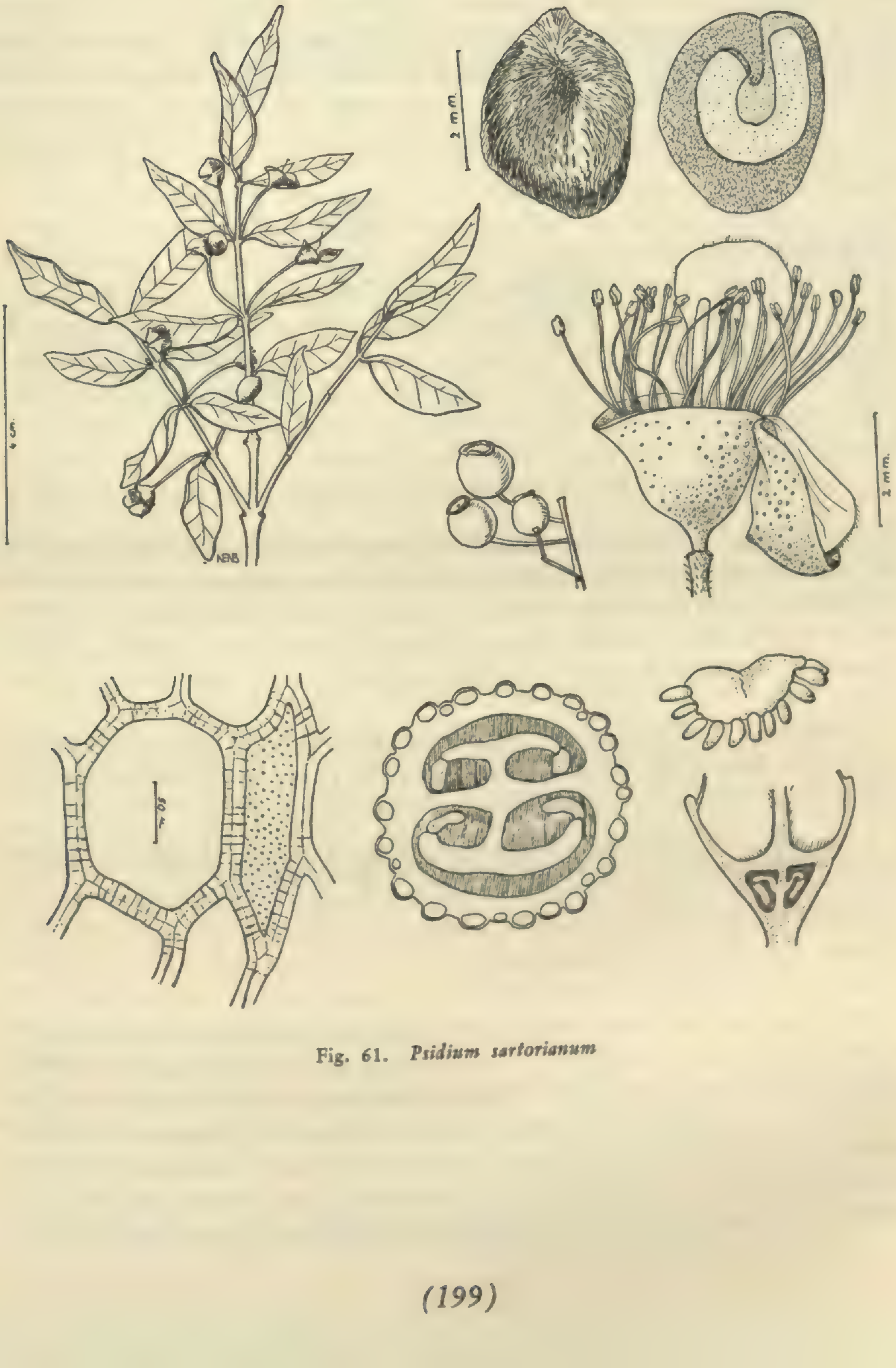

Fig. 61. *Psidium sartorianum*

3. PSIDIUM FRIEDRICHSTHALIANUM (Berg) Ndz. in Engl. & Prantl, Nat. Pflanzenfam. 3^7:69. 1893.

Calyptropsidium friedrichsthalianum Berg, in Linnaea 27:350. 1856.

Glabrous shrubs and small trees to 9 m. high, with spreading crown and crooked bole, the bark smooth and fluted, brown, the wood fine-grained and hard; young twigs 4-angular. Leaves shortly petiolate, elliptical or oblong, 8–12 cm. long and 4–5 cm. wide, membranaceous to chartaceous, glabrous, the midrib impressed above and prominent beneath, the lateral nerves in about 8 pairs, prominulous on both sides, especially beneath; petiole about 3 mm. long. Peduncles 1- to 3-flowered, 1.0–2.5 cm. long. Calyx globose in the bud, closed and apiculate, later 2- to 3-fid, the lobes circumscissile slightly above the ovary but remaining attached at one point and at length deciduous, about 1 cm. long. Petals orbiculate, about 1.5 cm. long or slightly less. Anthers oblong. Ovary glabrous, 3- to 5-celled; placenta 2-lamellate; ovules in 2–3 rows, involute; stigma peltate. Berry oval or globose, yellow, edible.

Fig. 62. *Psidium friedrichsthalianum*

Throughout Central America. Frequently cultivated for the fruits which are smaller than those of the common guava, have a tart agreeable flavor and are sometimes used for jellies. Vernacular name: *guayaba de agua.*

BOCAS DEL TORO: Changuinola valley, *Cooper & Slater 97, 97a.* CANAL ZONE: around Gamboa, *Pittier 4809, 6521.* CHIRIQUÍ: Progreso, *Cooper & Slater 278.*

4. PSIDIUM GUAJAVA L. Sp. Pl. 470. 1753.

Psidium pomiferum L. loc. cit. 672. 1762.
Psidium pyriferum L. loc. cit. 1762.

Shrubs or small trees with peculiar pale brown bark that scales off in thin sheets; young twigs 4-angular, pubescent. Leaves elliptical to oblong, rounded, obtuse or apiculate at the apex, rounded or obtuse at the base, 4–12 cm. long and 3.5–4.5 cm. broad, chartaceous, glabrescent on both sides, the midrib impressed above and prominent beneath, the lateral nerves 12–16 on each side, impressed above and prominent beneath, parallel and arcuate-anastomosing near the margin; petiole 3–4 mm. long. Peduncles axillary, 1- to 3-flowered, pubescent. Flower buds pubescent,

constricted under the calyx, 1.0–1.5 cm. long. Calyx closed in the bud, ellipsoid, irregularly 4- to 5-fid at anthesis, its segments about 1 cm. long, sericeous inside. Petals 1.5–2.0 cm. long. Anthers linear-oblong. Ovary 3- to 5-celled; placenta 2-lamellate; ovules in a triple row at each side of the placenta, turned in all directions. Berry pear-shaped or globose, 3–6 cm. in diameter, glabrate.

Cultivated throughout the tropics.

BOCAS DEL TORO: Isla Colón, *Von Wedel 2948*; Water Valley, *Von Wedel 821*. CANAL ZONE: Chagres, *Fendler 306*; in government forest along Las Cruces Trail, *Hunter & Allen 710*; Barro Colorado Island, *Wilson 17, Woodworth & Vestal 393, Wetmore & Abbe 149*; Ancón, *Pittier 2725*. CHIRIQUÍ: Llanos del Volcán, *Allen 1536*. COCLÉ: hills south of El Valle de Antón, *Allen 2524* (in part: mixed with *Ps. guineense*); Penonomé and vicinity, *Williams 237*. PANAMÁ: Juan Díaz region, near Tapía R., *Maxon & Harvey 6738*.

The common guava, native in tropical America and cultivated throughout the tropics of the world, is abundant in pastures and rather dry thickets. On the Pacific slope of Central America it often forms extensive thickets of characteristic appearance known as *guayabales*. The wood is brownish or reddish gray, hard, strong, elastic, close-grained and durable, but the trees are too small to be of much use. The Spanish name for the fruit is *guayaba*, and for the tree *guayabo*. The fruit varies greatly in size, shape, color and flavor, and has a musky odor that is remarkably penetrating. Raw it is somewhat insipid, but it makes an excellent jelly and is prepared in other ways. In general the fruit is little esteemed in Central America, but slices of the stiff, dark colored jelly are a frequent dessert dish.

5. PSIDIUM GUINEENSE Sw. Prodr. 77. 1788.

Psidium polycarpon Anders. ex Lamb. in Trans. Linn. Soc. 11:231. *t. 17*. 1815.
Psidium araca Raddi, Mem. 5. *t. 1*. 1821.
Psidium molle Bertol. Fl. Guat. 422. *t. 9*. 1840.
Guajava mollis (Bertol.) O. Ktze. Rev. Gen. 239. 1891.

Shrubs usually less than 1 m. high; young twigs compressed to subterete, pubescent. Leaves elliptical to oblong, rounded, obtuse or acutish at the apex, obtuse or acute at the base, up to 13 cm. long and 7 cm. broad, chartaceous, pubescent on both sides when young, glabrate except the midrib and veins beneath when adult, the lateral nerves about 7–10 on each side, prominulous to flat above, prominulous beneath, arcuate-anastomosing near the margin; petiole 4–10 mm. long. Peduncles 1- to 3-flowered, 2–3 cm. long, pubescent. Flower buds pubescent, constricted under the calyx, 1.0–1.5 cm. long. Calyx irregularly 4- to 5-fid at anthesis, the segments about 7 mm. long, sericeous within. Petals 5, about 1.5 cm. long. Anthers linear-oblong. Ovary about 5 mm. long, 3- to 5-celled; ovules in a triple row at each side of the 2-lamellate placenta, turned in all directions. Berry subglobose, about 2 cm. in diameter, yellow.

Native of tropical America and cultivated in other tropical countries. Vernacular names: *guayabita, guayaba arrayán*; *guayaba de sabana*.

CHIRIQUÍ: pastures around El Boquete, *Pittier 2946*; Llanos del Volcán and near Río Chiriquí Viejo, *Allen 1007, 1536*; vicinity of Callejón Seco, Volcán de Chiriquí, *Woodson & Schery 477, 505*. COCLÉ: between Las Margaritas and El Valle, *Allen & Seibert 1295*. PANAMÁ: San José Island, *Johnston 16, Erlanson 290*; La Campana, *Zetek 4228*.

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FLORA OF PANAMA

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Flora of Panama. Part VII, Fascicle 3 (Melastomataceae) . . .
. Robert E. Woodson, Jr., Robert W. Schery and Collaborators 203–304

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FLORA OF PANAMA

BY

ROBERT E. WOODSON, JR.

AND

ROBERT W. SCHERY

AND COLLABORATORS

PART VII

Fascicle 3

MELASTOMATACEAE (H. A. Gleason)

ANNALS

OF THE

MISSOURI BOTANICAL GARDEN

Vol. XLV SEPTEMBER, 1958 No. 3

FLORA OF PANAMA

Part VII. Fascicle 3*

MELASTOMATACEAE

By H. A. GLEASON

Flowers regular, perigynous or epigynous, usually 4- to 6-merous. Hypanthium cylindric to saucer-shaped, bearing the sepals, petals and stamens on a terminal torus. Calyx usually small, in most genera open in the bud, in some genera calyptrate. Petals distinct, large or small, usually white to pink or purple, rarely red or yellow, convolute in the bud. Stamens commonly twice as many as the petals, rarely more numerous, rarely fewer by abortion, isomorphic or dimorphic. Anthers basifixed, ovoid to subulate, 2-celled or 4-celled, opening by one (rarely two) terminal pores or in a few genera by short sub-terminal slits; connective often prolonged below the thecae or below the insertion of the filament into one or more lobes, spurs or appendages of various types. Ovary 1, 2- to several-celled, superior or inferior, commonly many-ovuled; style 1; stigma 1, punctiform to capitate. Fruit a loculicidal capsule more or less enclosed by the persistant hypanthium if from a superior ovary, or a berry if from an inferior ovary. Trees, shrubs, herbs or vines; leaves simple, opposite, often unequal, occasionally apparently alternate by abortion of one member of each pair, entire or toothed, usually 3- to several-nerved (1-nerved in *Mouriri* and a few species of other genera). Inflorescence always cymose, axillary or terminal, or flowers solitary.

About 200 genera and 4000 species, almost entirely tropical and most numerous in South America.

a. Fruit a loculicidal capsule; ovary superior, free from the hypanthium.
  b. Connective of the anthers bearing one or more dorsal spurs or appendages.
    c. Flowers (in our species) 5- to 6-merous; seeds linear or cuneiform. (Tribe MERIANEAE.)
      d. Calyx open in the bud, exposing the corolla.
        e. Climbing vines; leaves subrotund; pubescence of Malpighian hairs; seeds linear, winged at both ends, the embryo near the center..... 1. ADELOBOTRYS.
        ee. Trees; leaves ovate to oblong or elliptic; pubescence none or not Malpighian; seeds narrowly cuneiform, not winged, the embryo at the base.
          f. Basal spur of the connective sharp or conic..... 2. MERIANIA.

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* Assisted by a grant from The National Science Foundation.

Issued October 28, 1958.

ff. Basal spur of the connective inflated, rounded..... 3. AXINAEA.
dd. Calyx calyptrate in the bud, at anthesis deciduous at or near the torus.
e. Petals obovate or rounded, in our species about 18 mm. long. 4. CENTRONIA.
ee. Petals lanceolate to ovate, acuminate, in our species up to 7 mm. long..... 5. CALYPTRELLA.
cc. Flowers 4-merous; seeds short, cochleate. (Tribe RHEXIEAE.)..... 6. MONOCHAETUM.
bb. Connective of the anthers with ventral lobes, spurs, or appendages, or rarely nearly simple.
c. Capsule in cross-section round, sulcate or prismatic, or obscurely angled; flowers very rarely spicate.
d. Seeds not cochleate; fertile anthers 5 *or* leaves strongly dimorphic. (Tribe MICROLICIEAE.)
e. Fertile anthers 5, each tipped by a sterile beak; leaves essentially isomorphic..... 7. RHYNCHANTHERA.
ee. Fertile anthers 8; leaves strongly dimorphic..... 8. CENTRADENIA.
dd. Seeds cochleate; stamens all fertile; leaves essentially isomorphic. (Tribe TIBOUCHINEAE.)
e. Hairs of the upper leaf-surface (if present) not adnate to the epidermis for a portion of their length; ovary not setose at the summit (except in *Schwackaea*).
f. Connective of the outer series of stamens bearing at its base a single ventral appendage which is 2- to 3-toothed or 2-3-setose at its apex..... 9. ARTHROSTEMA.
ff. Connective of the outer series of stamens more or less evidently 2-lobed at base, or rarely (*Aciotis*) nearly simple.
g. Stamens strongly dimorphic, the connective of the outer series, between the base of the thecae and the summit of the filament, several times as long as that of the inner series.
h. Hypanthium wingless, campanulate to subglobose..... 10. HETEROCENTRUM.
hh. Hypanthium narrowly 8-winged, nearly cylindric..... 11. SCHWACKAEA.
gg. Stamens weakly dimorphic, usually differing somewhat in size.
h. Petals acute or acuminate.
i. Connective prolonged at base into two conspicuous ascending spurs..... 12. NEPSERA.
ii. Connective simple at base, or with two very short rounded lobes..... 13. ACIOTIS.
hh. Petals obtuse or rounded..... 14. ACISANTHERA.
ee. Hairs or scales of the upper leaf-surface adnate to the epidermis for a portion of their length; ovary setose at the summit.
f. Hypanthium hirsute with stout hairs from a branched base; hairs of the stem mostly geniculate at base; flowers 4-merous. 15. PTEROLEPIS.
ff. Hypanthium pubescent with simple or glandular hairs or scales or nearly glabrous; flowers 4-merous or (in all common species) 5-merous..... 16. TIBOUCHINA.
cc. Capsule in cross-section very strongly 3-winged, its distal margin much prolonged beyond the deeply concave summit; flowers sessile in dense secund spikes. (Tribe BERTOLONIEAE.)
d. Connective of the anther with a single ventral spur; herbs with basal leaves..... 17. MONOLENA.
dd. Connective with 2 or 3 basal spurs; leaves cauline.
e. Basal spurs of the connective 2; leaves commonly distinctly dimorphic..... 18. DIOLENA.
ee. Basal spurs of the anther 3; leaves commonly isomorphic..... 19. TRIOLENA.
aa. Fruit a berry; ovary wholly or partly inferior.
b. Anthers opening by a terminal or nearly terminal pore or pores (or in one species by a longitudinal ventral cleft in each theca), minutely or not at all glandular; leaves in all our species with 3 or more primary nerves.
c. Flowers individually subtended by two pairs of decussate bracts inserted at the base of the hypanthium; anthers coherent in a ring, each theca opening by a separate pore. (Tribe BLAKEAE.)

d. Anthers short, oval, oblong, or elliptic, blunt or broadly rounded at the summit..... 20. BLAKEA.
dd. Anthers linear to lanceolate or subulate..... 21. TOPOBEA.
cc. Flowers not individually subtended by decussate bracts; anthers separate at anthesis, in most species opening by a single pore. (Tribe MICONIEAE.)
d. Flowers lateral or axillary, solitary or cymose at the nodes of the stem.
e. Petals obtuse or rounded.
f. Anthers linear to oblong or subulate, opening by a single pore. (But see also *Clidemia pittieri*, with dimorphic, sessile, cordate-clasping leaves.)
g. Flowers or flower-clusters from the axils of existing leaves. 22. CLIDEMIA.
gg. Flowers from leafless nodes below the existing leaves..... 23. HENRIETTEA.
ff. Anthers broadly oblong or dolabriform, more or less coherent in a ring.
g. Anthers opening by two minute terminal pores..... 24. BELLUCIA.
gg. Anthers opening by a single pore..... 25. LOREYA.
ee. Petals acute or acuminate.
f. Flowers arising from leafless nodes below the existing leaves. 26. HENRIETTELLA.
ff. Flowers or flower-clusters arising from the axils of existing leaves..... 27. OSSAEA.
dd. Flowers in terminal inflorescences.
e. Petals acute or acuminate..... 28. LEANDRA.
ee. Petals obtuse, rounded or retuse.
f. Calyx calyptrate in bud, deciduous at the torus at anthesis. 29. CONOSTEGIA.
ff. Calyx open in the bud, its lobes persistent at anthesis, but often minute.
g. Formicaria present at the summit of the petioles of the larger leaves..... 30. TOCOCA.
gg. Formicaria none.
h. Younger stems and petioles (in the Panama species) at once stellate-tomentose, glandular-hirsute, and simply hirsute..... 31. HETEROTRICHUM.
hh. Pubescence never of three types at once..... 32. MICONIA.
bb. Anthers opening by two lateral slits, one on each side; connective bearing a large gland on the back near the middle of the anther; leaves (in our species) 1-nerved. (Tribe MEMECYLEAE.)..... 33. MOURIRI.

1. ADELOBOTRYS DC.

ADELOBOTRYS DC. Prod. 3:127. 1828.

Flowers 5-merous. Hypanthium campanulate to nearly tubular, becoming strongly ribbed at maturity. Calyx-tube spreading, its lobes short or obsolete. Petals obovate, conspicuous. Stamens isomorphic or dimorphic; filaments flattened, adherent to the base of the petals; anthers linear or subulate, deflexed, often arcuate; connective briefly prolonged below the thecae into a short, erect, conic or 2-toothed, basal spur, bearing a long, antrorse, dorsal appendage which is cleft at its apex and deflexed nearliy parallel to the thecae. Ovary free, 3- to 5-celled; style elongate; stigma capitellate. Capsule many-seeded; seeds linear-cuneate, winged at the apex, winged or caudate at base, bearing the embryo near the center. Woody lianas, climbing by adventitious roots, with oblong to rotund leaves and pink, white, or yellow flowers in panicled umbels or capitate clusters.

About 20 species of tropical America, extending from Mexico and Jamaica to Bolivia.

Fig. 63. *Adelobotrys adscendens*

1. ADELOBOTRYS ADSCENDENS (Sw.) Triana, in Journ. Bot. 5:210. 1867.

Melastoma adscendens Sw. Fl. Ind. Occ. 2:772. 1800.

Stems climbing several meters high, the younger parts, petioles, and inflorescence thinly brown-strigose; petioles 1–2 cm. long; leaf-blades firm or fleshy, subrotund, 6–10 cm. long, short-acuminate, entire or serrulate, rounded or truncate at base, 5-nerved, glabrous above; inflorescence a panicle 2–4 dm. long from the upper axils or terminal, each component umbel 2- to 6-flowered; pedicels 2–5 mm. long; hypanthium 5 mm. long; petals white, 10 mm. long; anthers 6–10 mm. long, the dorsal spur 3–4 mm. long.

Mexico to Panama; Jamaica.

BOCAS DEL TORO: Cricamola Valley, Almirante region, *Cooper 201*. CHIRIQUÍ: Río Chiriquí Viejo Valley, *White 79*. COLÓN: summit of Cerro Santa Rita, 360–450 m., *Allen 5106*.

2. MERIANIA Sw.

MERIANIA Sw. Fl. Ind. Occ. 2:823. 1800.

Flowers 5-merous or rarely 6-merous. Hypanthium campanulate to hemispheric, pubescent or glabrous. Calyx truncate to conspicuously lobed; exterior teeth often present and in some species exceeding the sepals. Petals large, purple to white. Stamens isomorphic or dimorphic; filaments elongate; anthers subulate to ovoid-lanceolate, declined in one direction transversely across the flower by the twisting of the filaments; connective sometimes prolonged at base and ending in a short, retrorse or divergent, basal spur, also in many species bearing a longer dorsal spur directed forward. Ovary superior, 3- to 5-celled; style elongate; stigma punctiform. Fruit a many-seeded capsule. Trees or shrubs, glabrous or variously pubescent, the flowers solitary in the axils or paniculate.

About 55 species; a few in the West Indies, others in southern Brazil, and most numerous in the mountains from Venezuela and Columbia to Peru. The following are the only known species in Central America.

a. Leaves cuneate at base, glabrous beneath..... 1. M. PANAMENSIS.
aa. Leaves rounded or subcordate at base, canescent beneath..... 2. M. MACROPHYLLA.

1. MERIANIA PANAMENSIS Gl. ex Woods. & Schery, in Ann. Mo. Bot. Gard. 28:436. 1941.

Tree up to 20 m. tall, smooth throughout; petioles 2.5–4 cm. long; leaf-blades ovate-elliptic, 8–13 cm. long, 4–7 cm. wide, shortly and obtusely cuspidate, entire, broadly cuneate at base, 5-nerved, the secondary veins 1–2 mm. apart; panicle large with widely diverging branches; hypanthium cup-shaped, 6.5 mm. wide; calyx spreading, 3–4 mm. wide, obscurely 5–lobed. Petals purple, 3 cm. long; stamens dimorphic; filaments 17 or 12 mm. long; anthers subulate, arcuate, 12 or 7 mm. long; connectives in one series merely dorsally gibbous at base, in the other series prolonged into a single spur 4 mm. long.

Endemic to Panama, so far as known.

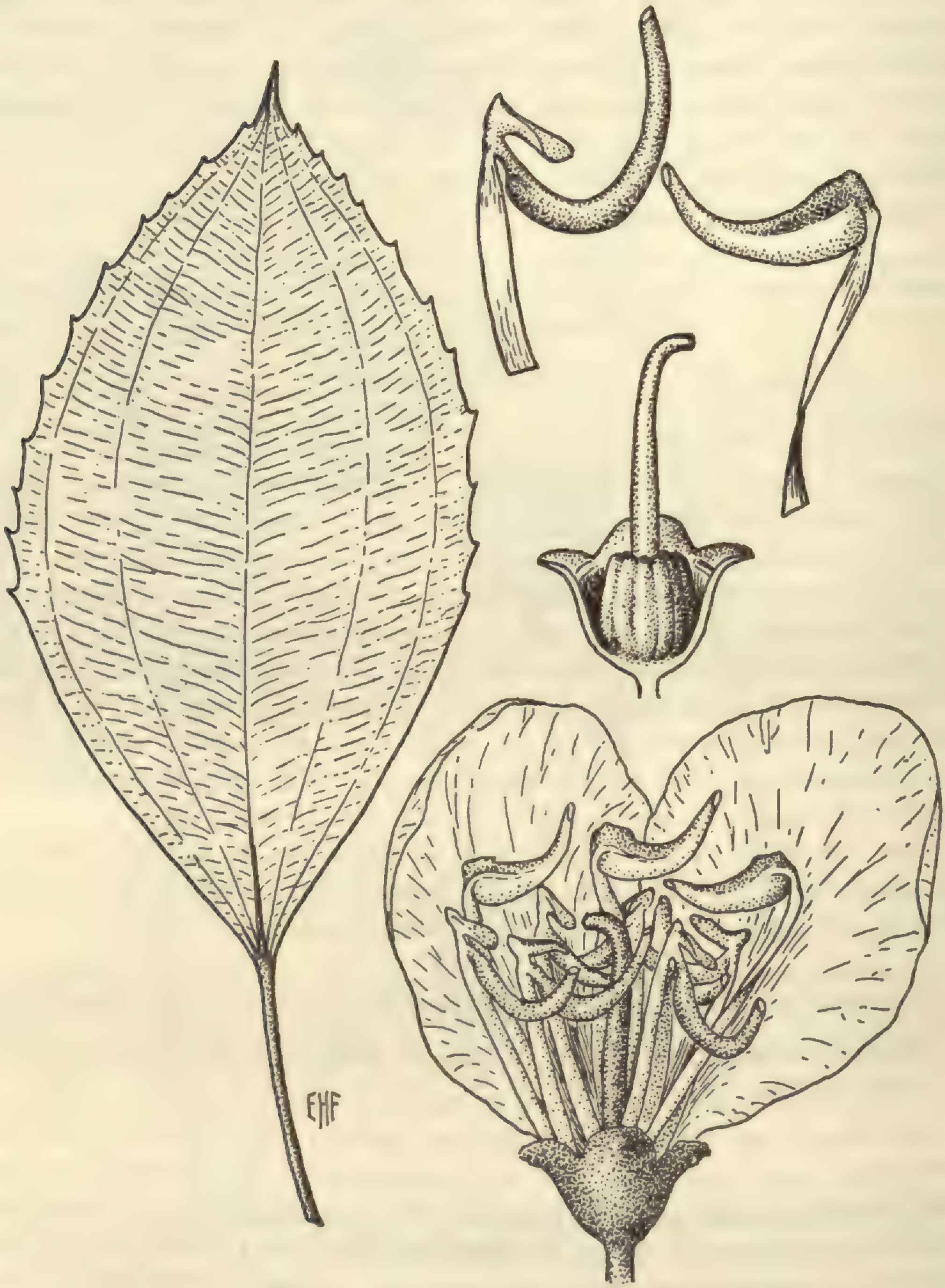

Fig. 64. *Meriania panamensis*

CHIRIQUÍ: Volcán de Chiriquí, 2300–3300 m., *Woodson & Schery 361*; vicinity of Cerro Punta, 2000 m., *Allen 3497*.

2. MERIANIA MACROPHYLLA (Benth.) Triana, in Trans. Linn. Soc. 28:66. 1871.

Davya macrophylla Benth. Pl. Hartweg. 75. 1839.
Conostegia excelsa Pittier, in Journ. Wash. Acad. Sci. 14:450. 1924.

Tree to 25 m. tall, the younger parts and petioles densely furfuraceous, glabrescent in age; leaves coriaceous, elliptic, up to 17 cm. long and 9 cm. wide, rounded or subcordate at base, where a transverse ridge crosses the petiole, glabrous above, canescent beneath; panicle widely branched; hypanthium and narrow truncate calyx glabrous; petals magenta, 12–15 mm. long; stamens dimorphic, the connective in the larger series prolonged into an erect bifurcate spur 7 mm. high.

Guatemala to Venezuela.

CHIRIQUÍ: Chiquero, Boquete district, 1650 m., *Davidson 506*; Las Siguas, *Pittier 3196*.

3. AXINAEA Ruiz & Pav.

AXINAEA Ruiz & Pav. Fl. Peruv. & Chil. Prodr. 68. 1794.

Flowers 4- to 5-merous. Hypanthium campanulate to saucer-shaped, glabrous or thinly pubescent. Calyx spreading, truncate or with short or depressed lobes; exterior teeth none. Stamens 8 or 10, nearly or quite isomorphic; filaments flattened, glabrous; anthers subulate, straight or somewhat arcuate; connective bearing at base a large, inflated, usually rounded, dorsal appendage. Ovary free, 5-celled; style usually slender and elongate; stigma truncate or punctiform. Fruit a many seeded capsule. Trees or shrubs with broad, usually petiolate leaves and large, white to purple flowers in terminal or axillary panicles; leaf-margins often somewhat dilated at base and more or less confluent over the petiole.

About 20 species of mountainous regions from Costa Rica to Venezuela and Bolivia; the following is the only known species in Central America.

1. AXINAEA COSTARICENSIS Cogn. in DC. Monogr. Phan. 7:1182. 1891.

Good-sized tree, the younger parts thinly furfuraceous but soon glabrescent. Petioles 1.5–3 cm. long. Leaf-blades oblong-elliptic, 10–15 cm. long, about half as wide, very abruptly acuminate, entire, minutely expanded at the obtuse base and bearing a median dorsal tubercle on the summit of the petiole, 5-nerved; panicle many-flowered, divergently branched, 1–3 dm. long, the flowers in terminal umbels on pedicels 5–10 mm. long; hypanthium and calyx together about 8 mm. wide; petals blood-red, 10–15 mm. long; anthers about 6 mm. long, the dorsal appendage white, rounded, nearly 4 mm. high.

Costa Rica and Panama.

BOCAS DEL TORO: Robalo Trail, northern slopes of Cerro Horqueta, 1800–2100 m., *Allen 4967*.

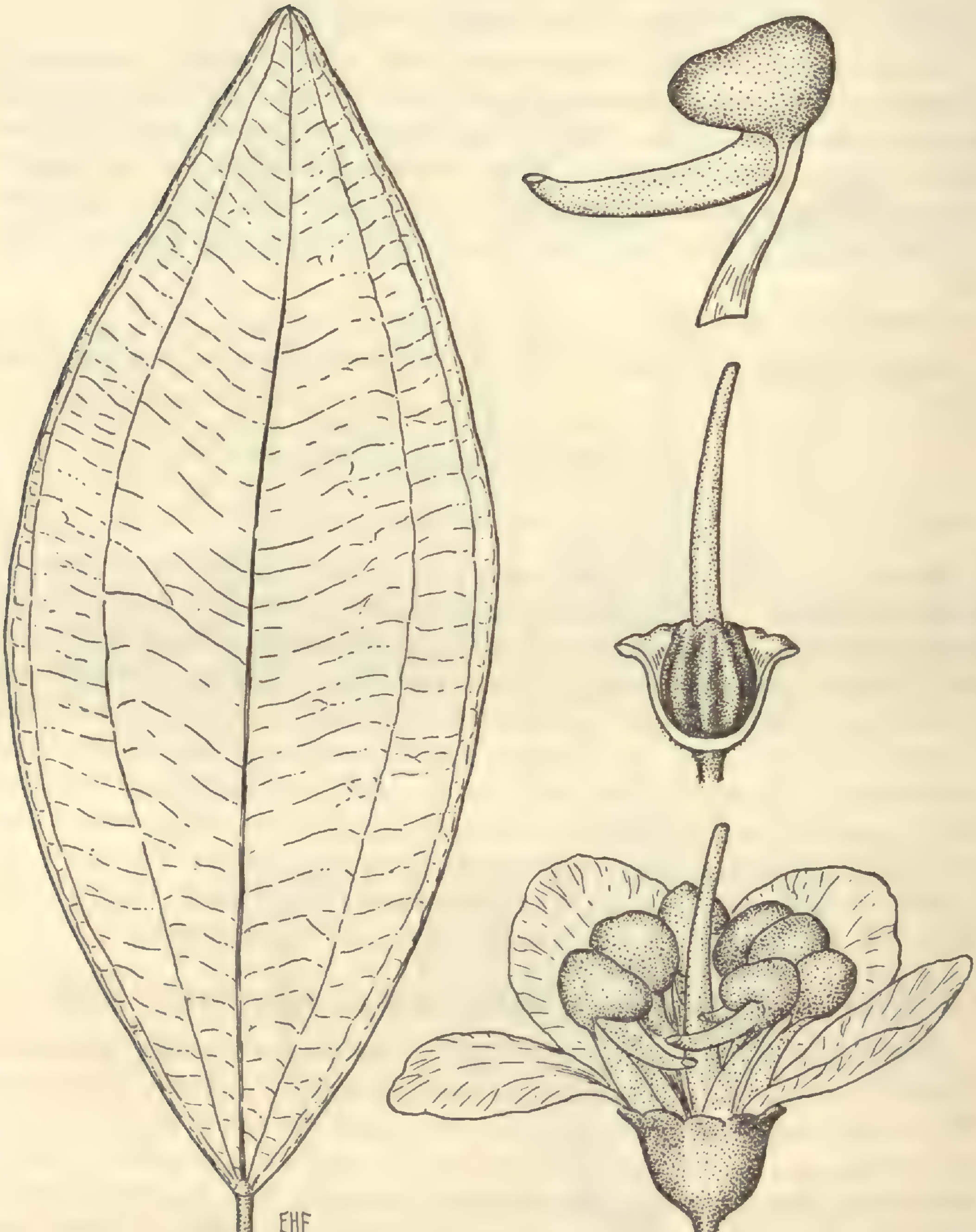

Fig. 65. *Axinaea costaricensis*

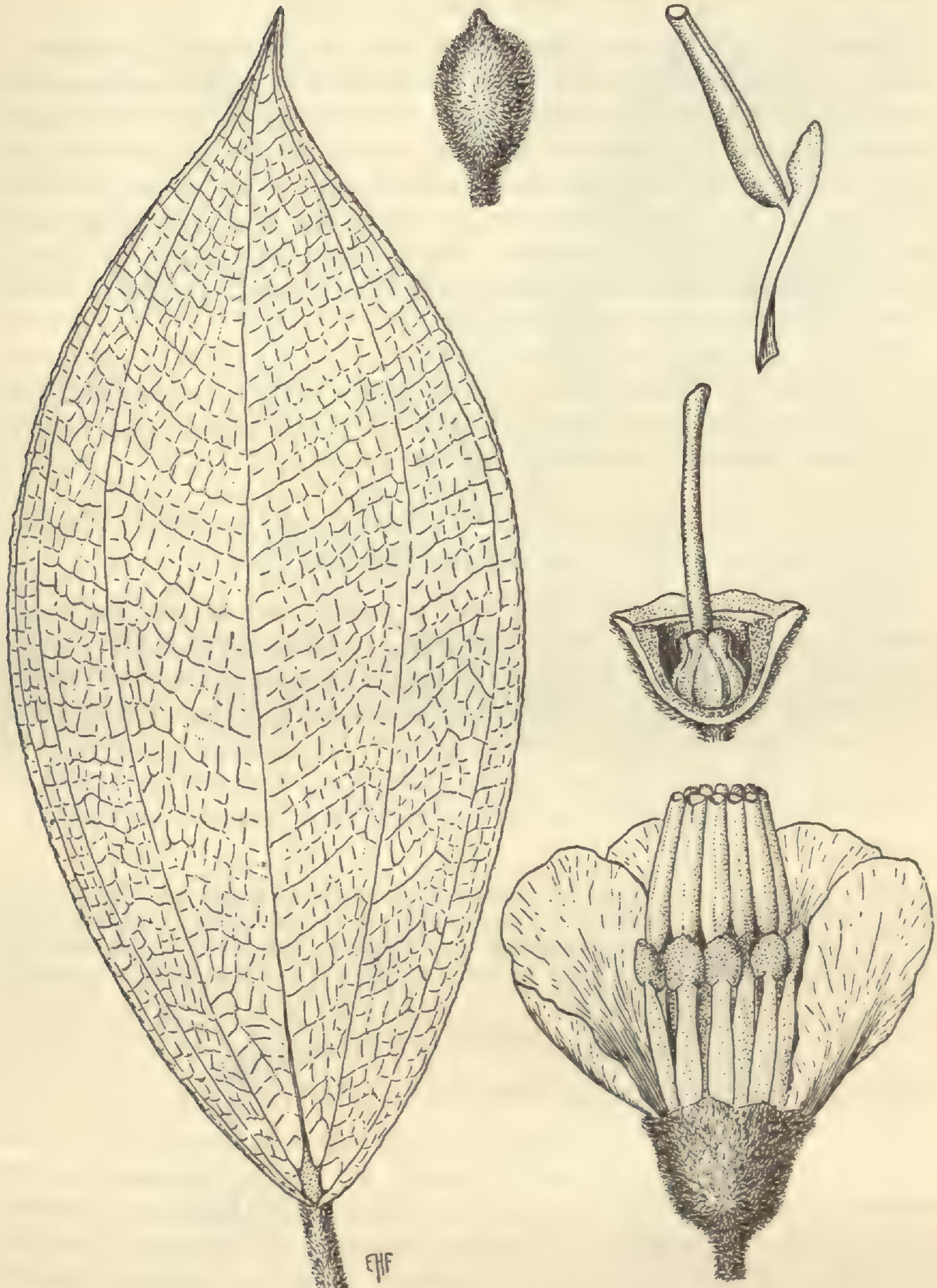

Fig. 66. *Centronia tomentosa*

4. CENTRONIA D. Don

CENTRONIA D. Don, in Mem. Wern. Soc. 4:314. 1823.

Flowers 5- to 7-merous. Hypanthium conic to hemispheric, pubescent or hirsute. Calyx calyptrate in bud, at anthesis breaking irregularly and soon deciduous. Petals large, red or purple. Stamens isomorphic or weakly dimorphic; filaments flat, more or less twisted at base; anthers subulate to lanceolate; connective often elevated along the thecae, at base bearing a conspicuous dorsal spur. Ovary free, 3- to 7-celled, often crowned with gibbosities or projecting appendages; style elongate; stigma truncate. Fruit a many-seeded capsule. Trees or shrubs with large leaves and large red or purple flowers usually disposed in terminal 3-flowered cymules in a large terminal panicle.

About 15 species in the mountains from Central America to Peru and eastward into Venezuela and British Guiana. *C. phlomoides* Triana, known from Costa Rica and Colombia, may be expected in Panama; it is at once distinguished from the following species by its strongly 5-pli-nerved leaves.

1. CENTRONIA TOMENTOSA Cogn. in Bull. Acad. Belg. III. 14:943. 1887.

Centronia grandiflora Standley, in Field Mus. Publ. Bot. 22:95. 1940.

Tree to 15 m. tall, the younger stems, petioles, and inflorescence rufous-tomentose; petioles 2–4 cm. long; leaf-blades ovate-lanceolate to elliptic, up to 15 cm. long and about half as wide, acuminate, denticulate, rounded or obtuse at base, 5-nerved or barely 5-pli-nerved, glabrous above, canescent on the surface beneath with minute stellate hairs ending in a long bristle; panicle long-peduncled, few-flowered, buds about 18 mm. long, short-rostrate; hypanthium about 1 cm. long, densely pubescent; petals white or greenish white, about 18 mm. long.

Panama to Ecuador.

BOCAS DEL TORO: Robalo Trail, northern slopes of Cerro Horqueta, 1800–2100 m., *Allen 4992*. CHIRIQUÍ: vicinity of Casita Alta, Volcán de Chiriquí, 1500–2000 m., *Woodson, Allen & Seibert 842*; vicinity of Bajo Chorro, 1900–2100 m., *Davidson 212, 360, Woodson & Schery 657*; Boquete region, *von Hagen & von Hagen 2102*; vicinity of Cerro Punta, 2000 m., *Allen 3492*.

5. CALYPTRELLA Naud.

CALYPTRELLA Naud. in Ann. Sci. Nat. Bot. III. 18:115. 1852.

Flowers 4- to 9-merous. Hypanthium cup-shaped to campanulate. Calyx calyptrate in the bud, at anthesis irregularly or regularly ruptured and soon deciduous at the torus. Petals small or medium-sized, lanceolate to obovate, commonly acute or acuminate. Stamens isomorphic or somewhat dimorphic; anthers linear; connective more or less prolonged below the thecae and extended beyond the apex of the filament into a single short dorsal spur. Ovary superior, 4- to 6-celled; stigma punctiform. Fruit a capsule; seeds linear with a central embryo. Trees or shrubs, with petiolate leaves and terminal paniculiform cymes, the white, yellow, or purple flowers often in small glomerules at the ends of the cyme-branches.

Fig. 67. *Calyptrella micrantha*

About 10 species of mountainous regions or adjacent lowlands from southern Mexico to Peru.

1. CALYPTRELLA MICRANTHA Gl. in Phytologia 3:346. 1950.

Shrub or tree 5–22 m. tall, essentially glabrous, but the hypanthium and lower leaf-surface thickly punctate with hyaline atoms; petioles 3–5 cm. long; leaf-blades thin, elliptic, up to 20 cm. long, two-fifths to half as wide, abruptly caudate-acuminate, entire, bearing a small retrorse appendage at each side of the obtuse base, 3-nerved; panicle divergently branched, 3–9 cm. long; flowers 5-merous, on pedicels 3–5 mm. long; hypanthium cup-shaped, 2 mm. long; calyx in bud slenderly conic, 3 mm. long, often falcate; petals white, narrowly lanceolate, long-acuminate, 3 mm. long.

Endemic to Panama.

BOCAS DEL TORO: Fish Creek Mountains, *von Wedel 2249*. COCLÉ: Cerro Pajita, north of El Valle de Antón, 1000–1200 m., *Allen 4175*. VERAGUAS: forested slopes of Cerro Tuté, vicinity of Santa Fé, 900 m., *Allen 4355*.

6. MONOCHAETUM Naud.

MONOCHAETUM Naud. in Ann. Sci. Nat. Bot. III. 4:48. *t. 2*. 1845.

Flowers 4-merous. Hypanthium tubular to narrowly campanulate. Calyx divided nearly or quite to the torus; sepals lanceolate to ovate, commonly acuminate, persistent (in our species) or deciduous after anthesis. Petals medium-sized, usually obovate. Stamens 8 and dimorphic, or rarely only 4 by abortion; filaments slender, smooth; anthers slender, linear or subulate, those of the larger series arcuate, bearing at base a single elongate, erect or ascending, dorsal appendage, those of the smaller series straight, the appendage commonly proportionately longer. Ovary superior, 4-celled, pubescent to setose at the summit; stigma punctiform. Fruit a 4-valved capsule; seeds cochleate. Small shrubs with comparatively small, linear to ovate, pli-nerved leaves and terminal cymes or cymules of pink, purple, or rarely white flowers.

About 35 species of the mountains from southern and western Mexico to Peru.

a. Pubescence of the upper part of the stem distinctly spreading; leaves ovate or ovate-lanceolate, commonly two-fifths to two-thirds as wide as long; bracteal leaves of the inflorescence scarcely smaller than the foliage leaves ..... 1. M. RIVULARE.

aa. Pubescence of the upper part of the stem distinctly strigose, the hairs appressed or ascending at a narrow angle; leaves commonly a fourth to a third as wide as long.

b. Flowers in a freely branched inflorescence; bracts ovate or oblong, much smaller than the leaves; large anthers 5–6 mm. long (excluding the spur).

c. Leaves lanceolate, broadest well below the middle, firm, softly villous beneath ..... 2. M. CYMOSUM

cc. Leaves broadest near the middle, thin, sparsely strigose on the lower side ..... 3. M. BRACTEOLATUM

bb. Flowers few in terminal cymules, the uppermost leaves scarcely reduced in size; large anthers 9–12 mm. long ..... 4. M. MACRANTHERUM

Fig. 68. *Monochaetum cymosum*

1. MONOCHAETUM RIVULARE Naud. in Ann. Sci. Nat. Bot. III. 4:50. 1845.

Shrub to 2 m. tall, laxly branched, the younger stems hirsute or hirsutulous with spreading, usually smooth hairs; leaves ovate, two-fifths to two-thirds as wide as long, hirsute above in poorly differentiated longitudinal strips, hirsute to villous beneath; hypanthium strigose.

Forma RIVULARE. Pubescence of simple hairs.

Guatemala to Panama.

CHIRIQUÍ: Bajo Chorro, Boquete district, 1800 m., *Davidson 88*.

Forma GLANDULOSUM Gl. in Am. Journ. Bot. 16:590. 1929.

Pubescence of the inflorescence and hypanthium very dense and partly glandular.

Costa Rica and Panama.

CHIRIQUÍ: Volcán de Chiriquí, 1500–2100 m., *Davidson 884, Woodson, Allen & Seibert 906 (in part)*.

2. MONOCHAETUM CYMOSUM Gl. in Am. Journ. Bot. 16:588. 1929.

Shrub to 3 m. tall; younger stems strigose with barbellate, appressed or somewhat ascending, eglandular hairs; leaves firm, lanceolate, 2–3 cm. long, a fourth to a third as wide, often acuminate, strigose above in four well-marked longitudinal strips each about as wide as the glabrous strip which parallels the conspicuously depressed primary nerves, hirsute or villous beneath, especially on the primary nerves; hypanthium strigose, eglandular; bracts ovate, 2–5 mm. long.

Endemic to Panama, so far as known.

CHIRIQUÍ: Volcán de Chiriquí, 1500–2000 m., *Woodson, Allen & Seibert 906 (part)*; Sierra del Boquete, *Maurice 746, Pittier 2861*; vicinity of Cerro Punta, 2000 m., *Allen 1513*.

3. MONOCHAETUM BRACTEOLATUM Triana, in Trans. Linn. Soc. 28:64. 1871.

Stem strigose with minutely barbellate eglandular hairs; leaves thin, narrowly elliptic or oblong, 3–5 cm. long, merely acute, sparsely strigose above in four strips between the nearly plane primary nerves, very sparsely strigose beneath; inflorescence and hypanthium strigose, eglandular; bracts ovate, 2–4 mm. long.

Endemic to Panama.

CHIRIQUÍ: vicinity of El Boquete, *Seemann 1668*.

4. MONOCHAETUM MACRANTHERUM Gl. in Am. Journ. Bot. 16:591. 1929.

Stem closely strigose with barbellate eglandular hairs, densely pilose at the nodes; leaves oblong-lanceolate, 2–3 cm. long, up to 1 cm. wide, subacute, very sparsely strigose on the upper side, often only toward the tip, sparsely strigose on the primary nerves beneath; inflorescence of mostly 3-flowered terminal cymules; hypanthium thinly strigose; large anthers 9–12 mm. long.

Panama and Costa Rica.

CHIRIQUÍ: Volcán de Chiriquí, *Maxon 5305*.

7. RHYNCHANTHERA DC.

RHYNCHANTHERA DC. Prod. 3:106. 1828.

Flowers 5-merous. Hypanthium ovoid to subglobose or campanulate, pubescent. Sepals erect or spreading, lanceolate to linear, often exceeding the hypanthium. Petals conspicuous, obovate. Fertile stamens 5, episepalous; filaments glabrous, usually stout, somewhat flattened; anthers subulate, rounded at base, prolonged distally into a slender one-pored beak; connective slender, greatly prolonged below the thecae, straight or arcuate, bituberculate, bicalcarate, or rarely unappendaged at base. Sterile stamens 5, opposite the petals, reduced to slender filaments, or lacking. Ovary free, 3- to 5-celled, glabrous, or distally setose or glandular; style elongate, filiform, declined or somewhat sigmoid; stigma punctiform. Capsule thickly ovoid or subglobose; seeds ovoid to oblong, straight or nearly so, minutely foveolate. Herbaceous or partly woody plants, usually densely pubescent or pilose and often glandular; flowers large, in numerous few-flowered cymes forming a terminal leafy panicle.

About 50 species, the others all in tropical South America, extending as far as Paraguay.

Fig. 69. *Rhynchanthera mexicana*

a. Stamens all equal or approximately equal in length; hairs of the hypanthium 1.5 to 2 mm. long..... 1. R. PALUDICOLA.
aa. Stamens unequal in length, the connective of one greatly prolonged; hairs of the hypanthium 0.5 mm. long or shorter..... 2. R. MEXICANA.

1. RHYNCHANTHERA PALUDICOLA (Donn. Sm.) Gl. in Phytologia. 1:136. 1935.

Tibouchina paludicola Donn. Sm. in Bot. Gaz. 42:293. 1906.

Stems, petioles, pedicels, and hypanthia sparsely glandular-pilose with hairs 1.5–2 mm. long; stem erect, angular, freely branched; petioles slender, 10–15 mm. long; leaf-blades ovate or ovate-oblong, 4–8 cm. long, 2–4 cm. wide, acuminate, minutely denticulate, rounded to subcordate at base, 7-nerved, pilose on both sides; inflorescence large, freely branched, the pedicels 2 mm. long; hypanthium campanulate, 6 mm. long, 10-ribbed; sepals linear-subulate, 6 mm. long; petals purple, broadly obovate, setose at the tip, 14 mm. long; sterile stamens 4.5 mm. long; filaments 5.5 mm. long; anthers 6.5 mm. long, tipped with a bent beak 2 mm. long, the connective prolonged 3 mm. at base; ovary free, 3-celled, minutely glandular-pubescent at the summit; style 19 mm. long.

Costa Rica and Panama.

CHIRIQUÍ: llanos del Volcán, *Allen 1549*; vicinity of Boquete, 1200–1500 m., *Woodson & Schery 739b, Davidson 588*. PROVINCE UNKNOWN: *Pittier 4942*.

2. RHYNCHANTHERA MEXICANA DC. Prod. 3:108. 1828.

Semi-frutescent, freely branched above, the stem, petioles, inflorescence, and hypanthium densely glandular-pubescent; petioles 8–12 mm. long; leaf-blades lanceolate to ovate-lanceolate, 5–8 cm. long, 2–3 cm. wide, slenderly acuminate, entire, rounded or broadly obtuse at base, 5- to 9-nerved, freely pubescent on both surfaces; bracteal leaves gradually reduced in size and proportionately narrower; inflorescence ample, many-flowered; pedicels mostly 2–5 mm. long; hypanthium narrowly campanulate, 4–5 mm. long; sepals linear-subulate, exceeding the hypanthium, pubescent; petals 25–30 mm. long, lavender or white to deep rose-purple; one connective much elongate; anthers, including the beak, 8–10 mm. long; capsule subglobose, glabrous, 5 mm. in diameter, 3-valved.

Southern Mexico and Panama.

COCLÉ: El Valle de Antón, 600 m., *Allen 2814*; vicinity of El Valle, *White & White 65, 66*; Penonomé and vicinity, *Williams 216*. HERRERA: vicinity of Ocú., *Allen 4044*. VERAGUAS: hills west of Soná, *Allen 1020*; vicinity of Santiago, about 50 m., *Allen 1014*; between Cañazas and the Cordillera Central, 300–600 m., *Allen 73*.

8. CENTRADENIA G. Don

CENTRADENIA G. Don, Gen. Syst. 2:755. 1832.

Flowers 4-merous. Hypanthium broadly campanulate, 8-ribbed, thin-walled, somewhat 4-angled. Calyx-tube briefly or not at all prolonged; sepals erect, ovate-triangular, acute or obtuse; exterior teeth none. Petals obovate or broadly elliptic, obtuse, entire or ciliate. Stamens dimorphic or isomorphic; filaments delicate, flat, glabrous; anthers ovoid to oblong, linear-oblong, or subulate, obtuse or acuminate,

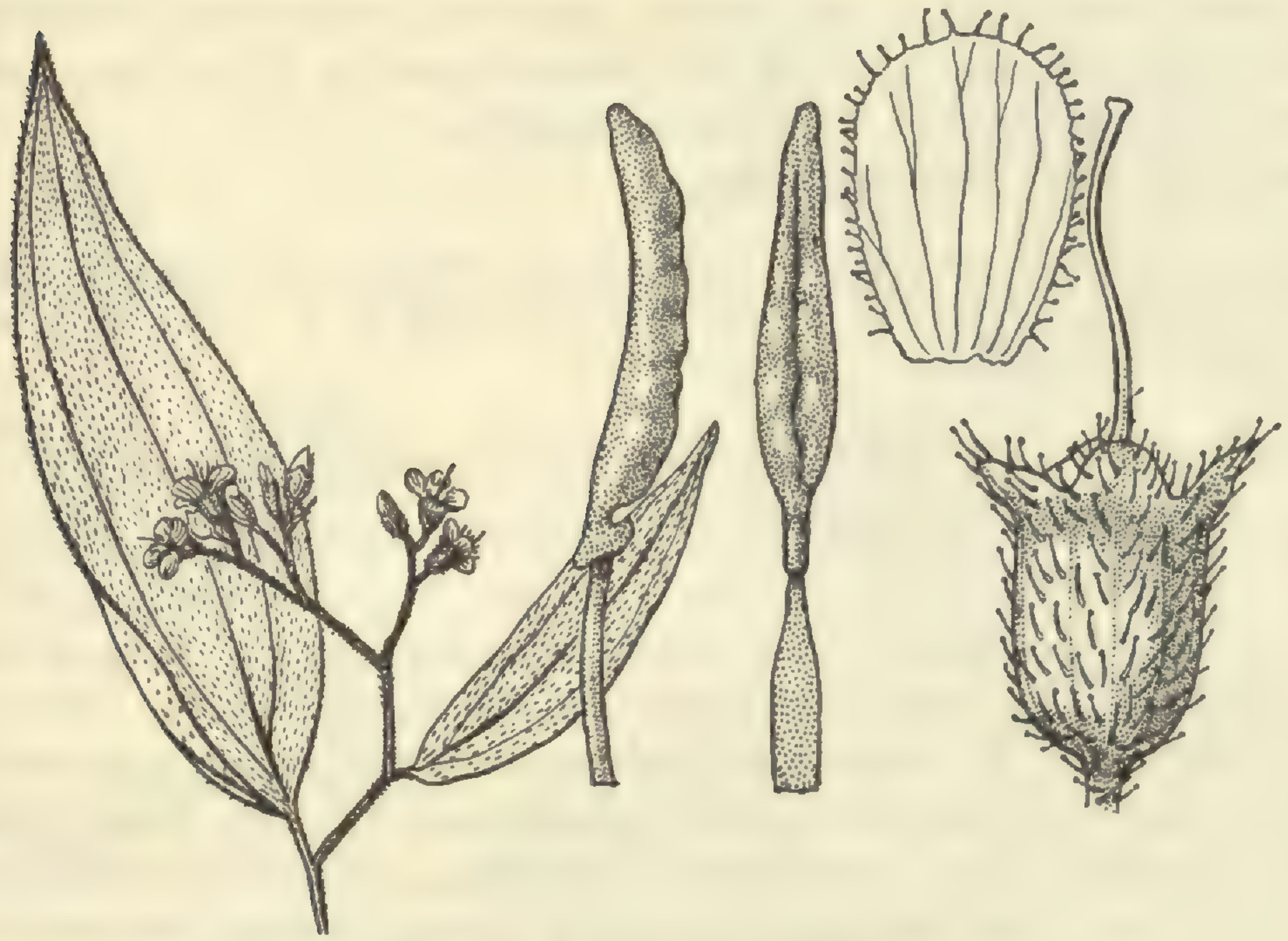

Fig. 70. *Centradenia maxoniana*

opening by a minute terminal pore; connective prolonged below the thecae, bearing at its base an anterior tubercle or a 2- to 3-lobed, truncate or rounded appendage. Ovary free, 4-celled, often glandular or setose; style slender, glabrous; stigma truncate. Capsule 4-valved; seeds clavate-ellipsoid. Herbs with terete, angled, or winged stems and lanceolate to narrowly oblong dimorphic leaves, the smaller member of each pair early deciduous; flowers few to many, in small cymes terminating the stem and branches; petals white to pink-purple, 5–10 mm. long.

Seven species in Mexico and Central America, one of them extending into Colombia.

a. Stamens strongly dimorphic; principal leaves 3–8 mm. wide..... 1. C. INAEQUILATERALIS.
aa. Stamens weakly dimorphic, differing chiefly in size; leaves 1.5–3.5 cm. wide..... 2. C. MAXONIANA.

1. CENTRADENIA INAEQUILATERALIS (Cham. & Schlecht.) G. Don. Gen. Hist. 2:765. 1832.

Rhexia inaequilateralis Cham. & Schlecht. in Linnaea 5:567. 1830.

Stems slender, subterete or obscurely 4-angled, pilosulous with spreading hairs; principal leaves straight or slightly falcate, thin, lanceolate, 25–50 mm. long, 3–8 mm. wide, acuminate, cuneate at base into a pilose petiole 1–3 mm. long, 3-nerved, minutely puberulous to almost completely glabrous; cymes laxly branched, often shorter than the upper leaves, thinly pilosulous; hypanthium broadly campanulate, 2.5 mm. long, sparsely pilose; sepals broadly ovate-triangular, obtuse, 0.8–1 mm. long; petals 6 mm. long, conspicuously ciliate; episepalous anthers 1.6 mm. long,

the connective prolonged 1.6 mm. to the filament and 1.6 mm. below the filament into a narrowly obtriangular, flat, truncate appendage; epipetalous anthers shorter, the connective prolonged 1 mm. to the filament, bearing on its base above the filament a flattened, ellipsoid, semi-adnate appendage.

Oaxaca and Veracruz to Panama.

CHIRIQUÍ: vicinity of El Boquete, 1000–1300 m., *Pittier 3040*. COCLÉ: vicinity of El Valle, 500–700 m., *Allen 766*, *Seibert 468*; hills north of El Valle, *Allen 2907*; El Valle de Antón, *Maurice 774*.

2. CENTRADENIA MAXONIANA Gl. in Bull. Torr. Bot. Club 65:571. 1941.

Stems slender, terete, sparsely branched, densely strigose; petioles 5 mm. long, strigose; leaf-blades lanceolate, straight or falcate, 8–15 cm. long, 1.5–3.5 cm. wide, inequilateral, acuminate, entire, at base cuneate on one side, acute to rounded on the other, 3-nerved, pubescent above, beneath strigose on the veins, thinly pilose to glabrous on the surface; smaller leaves linear-lanceolate, soon deciduous; panicle 2–3 cm. long, densely strigose; hypanthium 3.5 mm. long, glandular-pubescent; sepals triangular, 1 mm. long; petals oblong, 5 mm. long; anthers nearly isomorphic, 2.8 or 4 mm. long, linear-subulate; connective short, obliquely dilated at base, the anterior lobe ascending, truncate, the posterior descending, ovate.

Panama, Costa Rica and western Colombia.

CHIRIQUÍ: between Hato del Jobo and Cerro Vaca, 700–1000 m., *Pittier 5414*. COCLÉ: vicinity of El Valle, 600–1000 m., *Allen 112, 1175*. Bismark, above Penonomé, *Williams 321*.

9. ARTHROSTEMA Ruiz & Pav.

ARTHROSTEMA Ruiz & Pav. Fl. Peruv. & Chil. 4: *t. 326*. 1802.

Flowers 4-merous. Hypanthium obconic to narrowly campanulate, elongate, ribless or obscurely ribbed, glabrous or sparsely glandular-setose. Calyx-tube erect or spreading, persistent; sepals broader than long, rounded, obtuse, or apiculate. Petals obovate, apiculate, caducous. Stamens more or less dimorphic; filaments flat; episepalous anthers linear or oblong, straight or curved, the connective prolonged below the thecae and bearing a short or elongate, truncate, 2- to 3-toothed or 2-setose, anterior appendage; epipetalous anthers shorter, the connective shorter or not prolonged, bearing a relatively short, 2-toothed or 2-setose, anterior appendage. Ovary 4-celled, usually glabrous at the summit; style elongate, somewhat sigmoid; stigma punctiform. Capsule 4-valved. Seeds flattened, semi-ovoid, cochleate, marked with about 8 longitudinal, sometimes tuberculate ridges, the flat sides smooth above the hilum. Erect or scandent, slender, sparsely branched herbs or shrubs, with 4-angled to 4-winged stems, small, petiolate, lanceolate to ovate, 3- to 5-nerved leaves, and sessile or pediceled, pink to purple flowers in loosely branched cymes.

About 8 species of tropical America.

Fig. 71. *Arthrostema macrodesmum*

a. Flowers and capsules sessile or nearly so; anthers nearly isomorphic, the connective very briefly prolonged..... 1. A. ALATUM.
aa. Flowers pediceled; connective of the outer series of stamens prolonged 5–7 mm. below the anther..... 2. A. MACRODESMUM.

1. ARTHROSTEMA ALATUM Triana, in Trans. Linn. Soc. 28:35. 1871.

Stems erect, freely branched, narrowly 4-winged, 4-6 dm. tall, very sparsely glandular-setose; petioles 1–2 cm. long, winged distally; leaf-blades thin, bright green, ovate-oblong to broadly ovate, 3–7 cm. long, 2–4 cm. wide, acute, minutely ciliate-serrulate, rounded at base, 5-nerved, sparsely setose above, glabrous beneath; inflorescence many-flowered, divided into elongate spiciform branches; flowers sessile or nearly so; hypanthium narrowly campanulate, 4 mm. long, the erect calyx-tube obscurely lobed into depressed-triangular, minutely apiculate sepals 1 mm. long or shorter; petals pink, about 3 mm. long; stamens almost isomorphic; filaments 2 mm. long; anthers ovate, 0.8 mm. long; connective very briefly prolonged, bearing a single short, subulate, anterior spur; fruiting hypanthium long persistent, 10 mm. long, the flat sides of the seeds confluent over the end.

Southern Mexico, Salvador, Costa Rica, Panama, and Venezuela.

PANAMÁ: Punta Paitilla, *Heriberto 234*.

2. ARTHROSTEMMA MACRODESMUM Gl. in Williams, Fl. Trin. & Tob. 356, 357. 1934.

Arthrostema campanulare Triana, in Trans. Linn. Soc. Bot. 28:35. 1871. Not *A. campanulare* DC. 1828.

Stems climbing, 1–3 m. tall, sharply 4-angled or narrowly 4-winged, glabrous below, very sparsely glandular-setose above and in the inflorescence; leaves thin, bright green, ovate or ovate-lanceolate, 3–7 cm. long, 1.5–3 cm. wide, acuminate, truncate or subcordate at base, finely ciliate-serrulate, 5-nerved, glabrous or very sparsely setose; inflorescence loosely branched, few-flowered; pedicels about 5 mm. long, elongating in fruit; hypanthium glabrous, narrowly obconic, 8 mm. long; sepals triangular-subulate, about 1 mm. long, sometimes glandular-setose at the apex; petals pink to red or purple, 15–20 mm. long; episepalous anthers linear, nearly straight, 4–4.5 mm. long, the connective prolonged 5–7 mm. to the filament, its appendage 2.5–3 mm. long, 2- to 3-toothed at the apex; epipetalous anthers curved, 2.5–3 mm. long; connective not prolonged, bearing at its base two erect subulate appendages about 1 mm. long; fruiting hypanthium 15 mm. long.

From Chiapas southward through Central America and across northern South America to Peru and Trinidad.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 1220, 1248, 1368, 1500, 2614*; Water Valley, *von Wedel 831, 928, 2746*; Shepherd Island, *von Wedel 2716*; between Finca St. Louis and Konkintöe, *Woodson, Allen & Seibert 1907*; Potrero, Changuinola Valley, *Dunlap 72*. CANAL ZONE: Chagres, *Fendler 112*; Colón to Empire, *Crawford 518*. CHIRIQUÍ: vicinity of Boquete, *Maurice 699, Woodson & Schery 739a, Davidson 589*; Finca Lérida to Boquete, 1300–1700 m., *Woodson, Allen & Seibert 1142*. COCLÉ: El Valle de Antón, 600–1000 m., *Allen 1638*.

10. HETEROCENTRON Hook. & Arn.

HETEROCENTRON Hook. & Arn. in Bot. Beech. Voy. 290. 1840.

Heeria Schlecht. in Linnaea 13:432. 1839.
Schizocentron Meissn. Gen. Comm. 355. 1843.

Flowers 4-merous. Hypanthium broadly campanulate, rarely subglobose, setose at least at the summit. Sepals erect or spreading, separate to the base, ovate to linear-lanceolate, acute or acuminate, often involute distally, few-nerved. Petals rotund to obovate or broadly cuneate, commonly glandular-ciliate, somewhat inequilateral, flabellately veined. Stamens 8, dimorphic. Filaments slender, flat, glabrous, longer in the outer series. Anthers linear or linear-subulate, straight or nearly so, 2-celled, opening by a minute terminal pore; connective in the episepalous stamens prolonged conspicuously below the thecae to the insertion of the filament, there continued in the same direction into two slender, parallel, anterior spurs; connective of the epipetalous stamens very briefly prolonged below the thecae, slightly swollen and sometimes minutely tuberculate on the anterior side.

Fig. 72. *Heterocentron glandulosum*

Ovary free or adnate to the middle, 4-celled, its summit rounded or usually bearing 4 fleshy scales. Style slightly sigmoid, elongate, slender; stigma punctiform. Capsule about equaling the hypanthium, 4-valved. Seeds minute, obovoid, cochleate. Shrubs or half-shrubs, erect or rarely trailing, with 4-angled stems; leaves (in our species) multipli-nerved or apparently pinnately veined, the usual secondary veins lacking; inflorescence a terminal panicle or flowers rarely solitary; petals purple, rose-purple, or pink, 5–12 mm. long.

About 15 species of Mexico and Central America.

1. HETEROCENTRON GLANDULOSUM Schenck. in Regel, Gartenfl. 227. *t. 169.* 1856.

Stem erect, rather stout, obtusely 4-angled, densely strigose; leaf-blades oblong to obovate, 3–7 cm. long, 1.5–4 cm. wide, obtuse or acute, cuneate at base into a slender petiole, multipli-nerved, densely strigose above, subsericeous beneath; inflorescence ample, freely branched, rather crowded, strigose, becoming glandular above, the short pedicels and hypanthium densely glandular with spreading hairs; hypanthium broadly campanulate, 4 mm. long; sepals triangular-lanceolate, 4.5 mm. long, glabrous and entire; petals rotund, 7–8 mm. long; connective of the larger stamens 2.4 mm. long, tangentially flattened; ovary crowned with four quadrate scales nearly 1 mm. high and densely ciliate above.

Southern Mexico, Guatemala, Costa Rica, and Panama.

CHIRIQUÍ: near El Volcán, *White 233, 233a*; Boquete district, 1140 m., *Terry & Terry 1638.*

11. SCHWACKAEA Cogn.

SCHWACKAEA Cogn. ex Durand Index Gen. Phan. 132. 1888.–Nomen; DC. Mon. Phan. 7:182. 1891.

Flowers 4-merous. Hypanthium cylindric, prominently 8-ribbed, the ribs somewhat tuberculate or papillose-strigose. Sepals linear-lanceolate, erect, pectinate-ciliate. Petals small, obovate, setose at the apex. Stamens 8, dimorphic; filaments glabrous, very slender; anthers of the outer series oblong-ovoid, somewhat curved, the connective horizontal or declined, arcuate, as long as or longer than the anther, bearing 2 short, blunt, basal, anterior spurs; anthers of the inner series ovoid, straight, truncate, the connective very short, bearing 2 short, blunt, anterior spurs. Ovary free, 4-celled, oblong, glabrous below, tipped with about 8 short setae. Style short, clavate, strongly incurved above to the broad stigma. Hypanthium enlarged and thickened in fruit, with 8 rounded, corky, tuberculate ribs. Capsule oblong, free. Seeds minute, cochleate. Annual, freely branched herb, the leaves soon deciduous, with numerous small pink flowers in leafy cymes.

Only the following species.

1. SCHWACKAEA CUPHEOIDES (Benth.) Cogn. ex Durand, Index Gen. Phan. 132. 1888.

Fig. 73. *Schwackaea cupheoides*

Heeria cupheoides Benth. Bot. Voy. Sulphur 93. *t. 33.* 1844.
Pterogastra cupheoides (Benth.) Seem. Bot. Voy. Herald 122. 1853.

Stem repeatedly branched, 2–10 dm. tall, reddish, 4-angled, setose on the nodes and angles to nearly glabrous; petioles slender, 2–8 mm. long, leaf-blades oval or oblong, 1–6 cm. long, 0.5–3 cm. wide, acute, entire, acute or obtuse at the base, 3-nerved, minutely pubescent, especially on the veins, to nearly glabrous; flowers sessile; hypanthium 4 mm. long; sepals 2.5–3 mm. long; petals 5 mm. long; anthers 0.7 or 1.2 mm. long, the basal spurs of the connective 0.5 mm. long; fruiting hypanthium 1 cm. long; seeds 0.4–0.5 mm. long.

Southern Mexico to Panama and Colombia.

CANAL ZONE: Barro Colorado Island, *Killip 40033*, *Shattuck 299*, *485*; Darién, *Macbride 2702*; Obispo, *Hayes 151*; Paraíso, *Hayes 25*; Chagres, *Fendler 113*; Río Grande near Culebra, *Pittier 2108*. PANAMÁ: near Alhajuela, Chagres Valley, *Pittier 2395*; San José Island, *Johnston 176, 219, 936A*.

12. NEPSERA Naud.

NEPSERA Naud. in Ann. Sci. Nat. Bot. III. 13:28. 1850.

Flowers 4-merous. Hypanthium campanulate to subglobose. Sepals triangular-ovate or triangular-lanceolate, about equaling the hypanthium, acuminate. Petals ovate to ovate-lanceolate, acute and apiculate. Stamens isomorphic, differing slightly in size; anthers erect, linear or linear-subulate; connective prolonged briefly below the thecae, somewhat expanded at the insertion of the filament, and bearing 2 erect slender anterior appendages. Ovary free, sub-globose, glabrous, 3-celled; style straight, slender; stigma punctiform. Capsule 3-valved, closely invested by the hypanthium; seeds stoutly semiovoid, cochleate, finely tuberculate. Slender, freely branched, erect herbs, with very numerous, small, white to pink flowers in a large, diffusely branched, terminal panicle.

Only the following species.

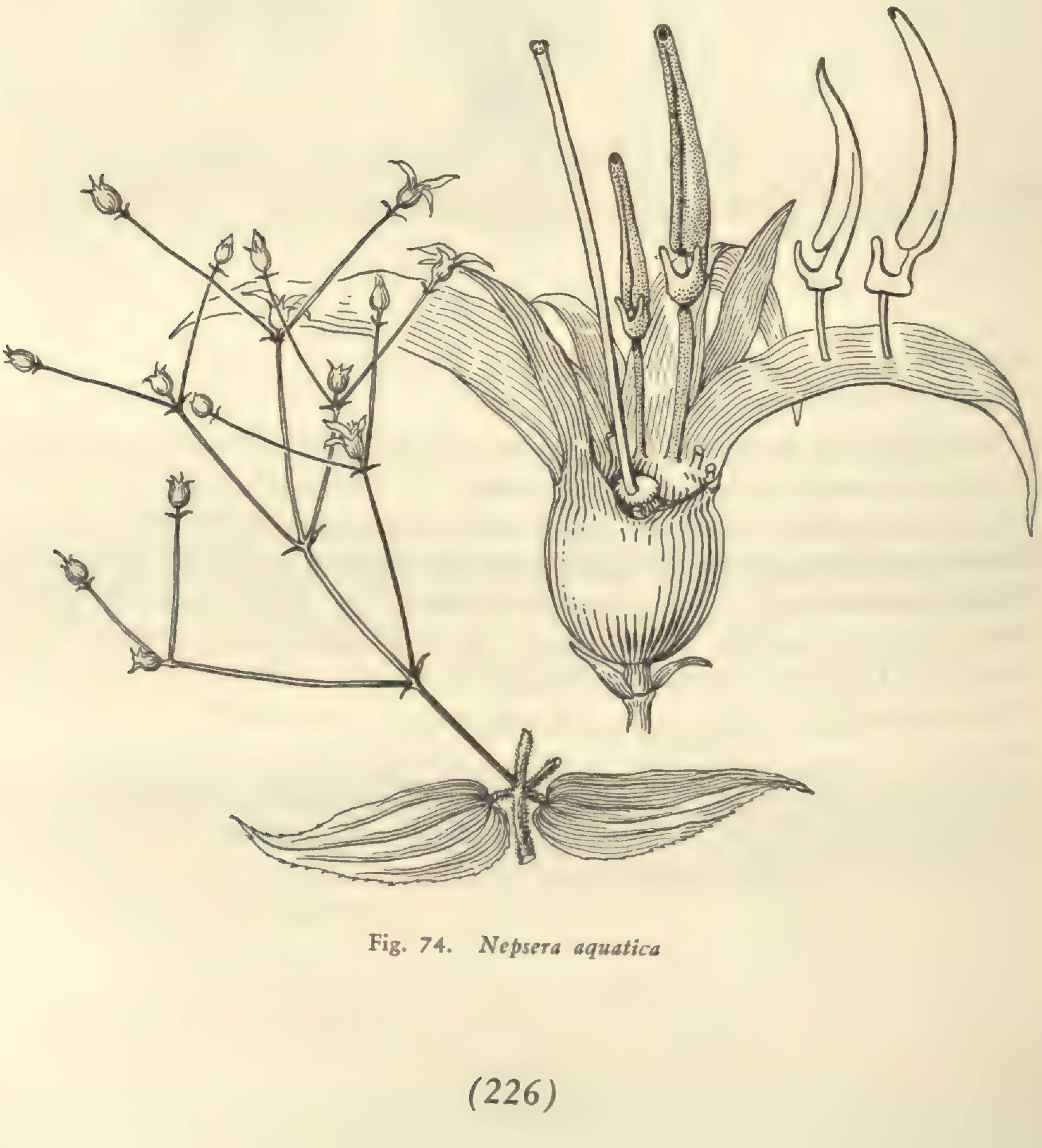

Fig. 74. *Nepsera aquatica*

1. NEPSERA AQUATICA (Aubl.) Naud. in Ann. Sci. Nat. Bot. III. 13:28. 1850.

Melastoma aquaticum Aubl. Pl. Guian. 1:430. *t. 169.* 1775.

Stems 3–10 dm. tall, 4-angled, glabrous to minutely pubescent; petioles slender, 5–10 mm. long; leaf-blades ovate or ovate-lanceolate, 2–6 cm. long, acute or acuminate, finely serrulate, rounded or subcordate at base, 5- to 7-nerved, glabrous or sparsely pubescent; panicle 1–4 dm. long, the pedicels slender and elongate; hypanthium about 3 mm. long; petals 5–7 mm. long.

British Honduras to Panama; Jamaica, Hispaniola, Puerto Rico, and the Lesser Antilles; widely distributed in tropical South America.

BOCAS DEL TORO: Water Valley, *von Wedel 825*; vicinity of Chiriquí Lagoon, *von Wedel 1133, 2485, 2551*; Columbus Island, *von Wedel 33*. PROVINCE UNKNOWN: *Moore 21*.

13. ACIOTIS D. Don

ACIOTIS D. Don, in Mem. Wern. Soc. 4:300. 1823.

Flowers 4-merous. Hypanthium thin-walled, narrowly campanulate at anthesis. Calyx-lobes minute, triangular, often glandular-setose at the apex. Petals lanceolate to obovate, acute or acuminate, commonly glandular-setose at the apex. Stamens 8, isomorphic or weakly dimorphic; anthers narrowly oblong to elliptic or nearly globose, blunt; connective somewhat prolonged below the thecae, articulate to the apex of the filament, either simple or with two minute ventral lobes. Ovary superior, 2-celled; stigma truncate or capitellate. Fruit a globose thin-walled capsule, rupturing irregularly at maturity; seeds rugose, cochleate. Erect or spreading herbs with lanceolate to ovate leaves and terminal, divaricately branched, paniculiform cymes of small, ephemeral, white or pink flowers.

About 30 species, widely distributed in tropical America but most numerous in lowland forests of high rainfall.

a. Leaves pubescent beneath.
  b. Stems winged, pubescent with mostly simple hairs 1–1.5 mm. long..... 1. A. LEVYANA.
  bb. Stems merely angled, pubescent with mostly glandular hairs 0.2–0.8 mm. long..... 2. A. ROSTELLATA.
aa. Leaves glabrous beneath..... 3. A. PURPURASCENS.

1. ACIOTIS LEVYANA Cogn. in Mart. Fl. Bras. 14^3:460. 1885.

Stems herbaceous, branched, up to 1 m. tall, prominently and often broadly winged, each wing ciliate and more or less hirsutulous on the surface with widely spreading hairs 1–1.5 mm. long, commonly simple but occasionally glandular; petioles winged, pubescent like the stem; leaf-blades oblong to oblong-lanceolate, to 1 dm. long, a third to half as wide, pubescent on both sides; fourth and fifth veins arising from the second and third just above the base; panicle-branches winged, hirsutulous, especially on the wings, with simple hairs commonly 1–1.5 mm. long.

British Honduras to Panama, chiefly at low elevations.

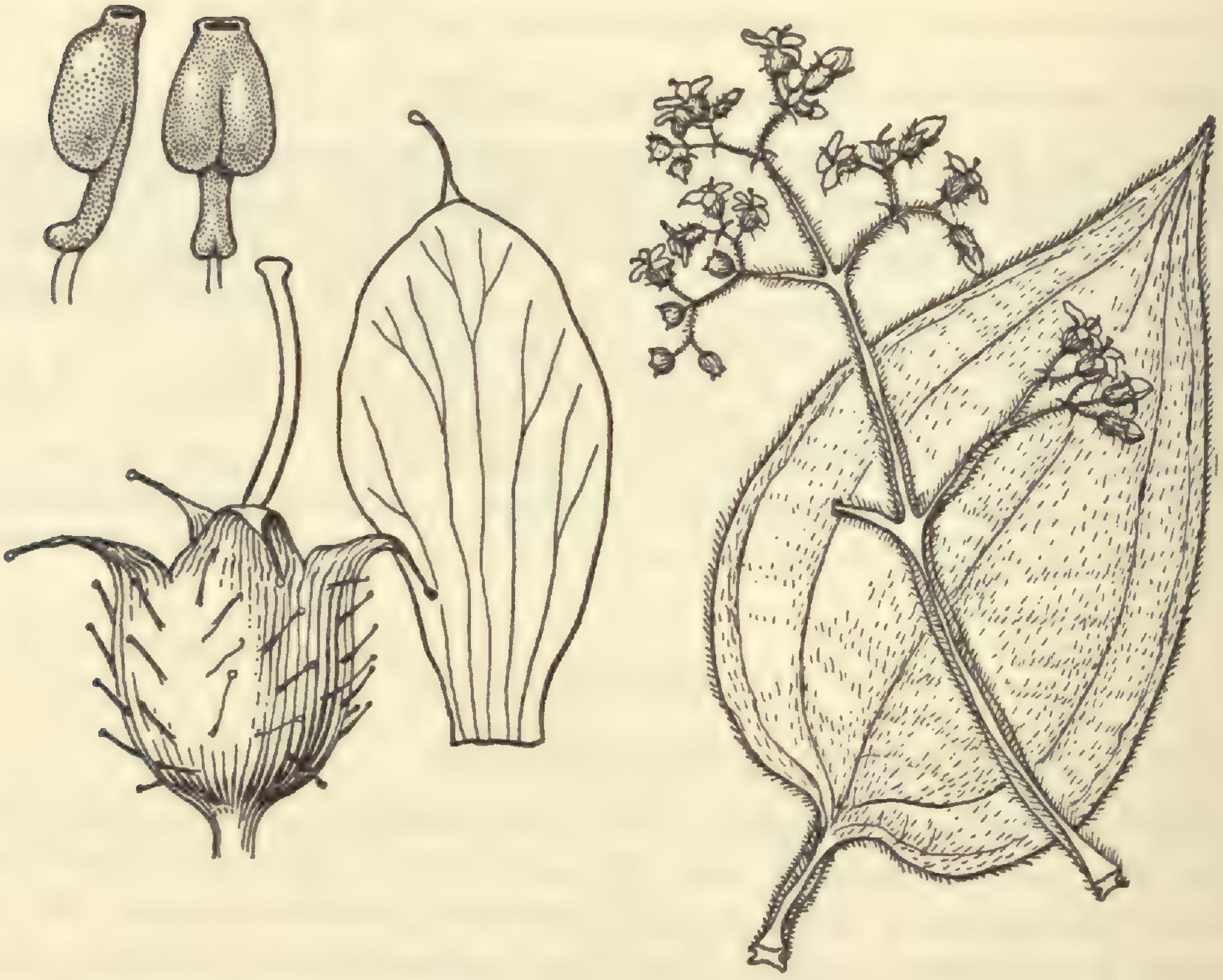

Fig. 75. *Aciotis levyana*

BOCAS DEL TORO: Water Valley, *von Wedel 782, 1450.* CANAL ZONE: Barro Colorado Island, *Bailey & Bailey 581*; Gatún, *Hayes 165*; vicinity of Porto Bello, *Pittier 2440*; Santa Rita trail, *Cowell 139.* COCLÉ: vicinity of El Valle, *Allen 218.*

2. ACIOTIS ROSTELLATA (Naud.) Triana, in Trans. Linn. Soc. 28:51. 1871.

Spennera rostellata Naud. in Ann. Sci. Nat. Bot. III. 14:143. 1850.

Similar to the preceding species in general habit and size; stem sharply 4-angled but not winged, densely and softly pubescent with spreading, mostly glandular hairs commonly about 0.5 mm., rarely as much as 1 mm. long; petioles wingless, pubescent like the stem; leaf-blades ovate or oblong, to 1 dm. long, about half as wide, pubescent on both sides, the five nerves all arising together at the base; panicle-branches merely angled, glandular-pubescent with hairs 0.2–0.5 mm. long.

Southern Mexico to Panama.

BOCAS DEL TORO: Nances Cay, *von Wedel 582, 2863.* COCLÉ: Bismarck, above Penonomé, *Williams 289.* DARIÉN; Cana and vicinity, *Williams 735.*

3. ACIOTIS PURPURASCENS (Aubl.) Triana, in Trans. Linn. Soc. 28:52. *t. 3.* 1871.

Melastoma purpurascens Aubl. Pl. Guian. 1:402. 1775.

Glandular pubescence lacking. Stems herbaceous, to 1 m. tall, simple or branched above, 4-winged, glabrous or ciliate on the wings with minute incurved

hairs; petioles winged; leaf-blades lanceolate to oblong, to 15 cm. long, a fourth to a third or even half as wide, glabrous beneath, glabrous or very sparsely pilosulous above, often ciliate with incurved hairs; panicle-branches winged, commonly glabrous; hypanthium glabrous.

Widely distributed in northern South America, northward to Trinidad and Panama. The Panama collection cited below is the type of variety *alata* Cogn., and has leaves half as wide as long, pilosulous above, and distinctly ciliate.

CANAL ZONE: Chagres, *Fendler 149*.

14. ACISANTHERA P. Br.

ACISANTHERA P. Br. Hist. Jamaic. 217. *t. 22.* 1756.

Flowers 4-merous or 5-merous. Hypanthium subglobose to broadly campanulate. Calyx-tube none or very short; sepals triangular to ovate or oblong, equaling or exceeding the hypanthium. Petals usually small, mostly obovate. Stamens dimorphic, the epipetalous series smaller or in some species imperfect. Anthers obovoid to subulate; connective in the episepalous series prolonged below the thecae, bearing at base two rounded to linear, anterior appendages; that of the epipetalous stamens shorter or not prolonged, with two short or tuberculiform appendages. Ovary free, usually subglobose, 2- to 4-celled; style slender; stigma punctiform or truncate. Capsule 2- to 4-valved; seeds ovoid or oblong, more or less cochleate, minutely foveolate. Herbaceous or suffrutescent, simple or freely branched plants, with small, dentate to entire leaves and small, axillary or paniculate, white to pink or purple flowers.

About 20 species, most numerous at low altitudes in South America; two others occur elsewhere in Central America and one in Cuba.

a. Leaves ovate to ovate-oblong, conspicuously denticulate or crenate, cuneate to the petiole; stems freely and diffusely branched.
  b. Appendages of the episepalous stamens lanceolate to linear, acute or subacute; connective of the epipetalous stamens straight to the filament, about 0.2 mm. long ..... 1. A. QUADRATA.
  bb. Appendages of the episepalous stamens clavate or narrowly obovoid, blunt or rounded; connective of the epipetalous stamens at right angles to the anther, prolonged about 0.5 mm. to the filament ..... 2. A. UNIFLORA.
aa. Leaves ovate to subrotund, entire or essentially so, strictly sessile at the broad base; stems erect, simple or sparingly branched ..... 3. A. LIMNOBIOS.

1. ACISANTHERA QUADRATA Pers. Syn. Pl. 1:477. 1805.

Stem freely branched, 2–4 dm. tall, sharply angled or narrowly 4-winged, setose at the nodes, on the internodes glabrous, pilosulous, or glandular-pubescent; leaf-blades ovate, ovate-oblong, or oblong, 1–2 cm. long by half as wide, acute or subacute, cuneate at base into a short petiole, 3-nerved, glabrous, pubescent, or glandular; flowers solitary in the axils, on pedicels 1–4 mm. long; hypanthium broadly campanulate, 2 mm. long, usually glabrous, sometimes sparsely pubescent or glandular; sepals triangular, equaling the hypanthium; petals 5–6 mm. long; episepalous anthers truncate, about equaling the connective, this bearing two

Fig. 76. *Acisanthera quadrata*

slender spurs about 1 mm. long; epipetalous anthers smaller, the connective barely prolonged and bearing two minute, rounded, basal tubercles.

Throughout Central America, north to Veracruz and Acapulco; Greater Antilles; South America, where it is less abundant than the next species; reported from Dominica.

CHIRIQUÍ: Boquete, *Davidson 599*. COCLÉ: El Valle de Antón, about 600 m., *Allen 1989*; vicinity of El Valle, *Allen 1174*; vicinity of Penonomé, *Williams 163*. VERAGUAS: hills west of Soná, about 500 m., *Allen 1071*. PANAMÁ: vicinity of Pacora, about 35 m., *Allen 987*; vicinity of Juan Díaz, *Killip 3262*; San José Island, *Johnston 823*. PROVINCE UNKNOWN: *Pittier 4906*.

2. ACISANTHERA UNIFLORA (Vahl) Gl. in Phytologia 3:346. 1950.

Rhexia uniflora Vahl, Symb. 2:48. 1791.
Rhexia recurva L. C. Rich. in Act. Soc. Nat. Hist. Paris 1792:108. 1792.
Acisanthera recurva of recent literature.

Much resembling the preceding in habit and foliage, but the leaves usually proportionately narrower and the leaves, pedicels, and hypanthium more densely

glandular-pubescent; sepals linear-oblong, obtuse, 3 mm. long; anthers of the episepalous stamens linear-subulate, 2 mm. long, the erect appendages clavate or narrowly obovoid; anthers of the epipetalous stamens similar, 1.5 mm. long, the connective prolonged 0.5 mm. at base and bearing two erect, rounded appendages 0.2 mm. long.

Widely distributed in South America; reported from Panama and Costa Rica.

3. ACISANTHERA LIMNOBIOS (DC.) Triana, in Trans. Linn. Soc. 28:33. *t. 11.* 1871.

Rhexia limnobios DC. Prodr. 3:117. 1828.

Stems stout, often inflated at base, 5–20 cm. tall, simple or sparingly branched, sharply 4-angled or narrowly 4-winged, increasingly glandular-pubescent above; leaves sessile, broadly ovate to subrotund, 5–10 mm. long, subcordate and clasping at base, entire to remotely denticulate or the uppermost glandular-ciliate, obscurely 5- to 7-nerved; pedicels 2–3 mm. long, glandular-pubescent; hypanthium campanulate, 2–2.5 mm. long, glandular-pubescent; sepals triangular-lingulate, 2.5–3 mm. long, obtuse, glandular-pubescent; petals obovate, 4 mm. long; filaments 2.6 or 2.2 mm. long; anthers narrowly oblong, 1.8 or 1.2 mm. long, the larger declined, the smaller erect; connective of the larger anthers horizontal, nearly 1 mm. long, with two erect, flattened, completely separate, obtuse appendages 0.8 mm. long; connective of the smaller anthers short, straight, with two rounded basal tubercles.

Panama and Colombia to Brazil; also known from Honduras.

COCLÉ: El Valle de Antón, about 600 m., *Allen 1990.*

15. PTEROLEPIS (DC.) Miq.

PTEROLEPIS Miq. Comm. Phyt. 72. 1840.

Flowers 4-merous. Hypanthium broadly or narrowly campanulate, sometimes ribbed, pubescent with simple, branched, or glandular hairs, persistent and accrescent in fruit. Calyx-tube not prolonged; sepals erect, triangular, acute, ciliate. Petals small, obovate, often ciliate. Stamens dimorphic. Filaments slender, flat, straight, glabrous. Anthers subulate to ovoid or obovoid; connective more or less prolonged below the thecae, often horizontal or arcuate, terminating in two small anterior appendages or lobes. Ovary free, oblong to cylindric, 4-celled, glabrous below, crowned with stiff erect setae surrounding the base of the straight slender style; stigma small, capitate. Capsule 4-valved, included by the hypanthium; seeds minute, cochleate, finely tuberculate. Erect, freely branched herbs, with ovate to linear leaves and cymose or glomerate, sessile or subsessile, pink or white flowers; hairs of the stem often geniculate or prolonged backward at base, those of the hypanthium often branched from the end of a conspicuous stipe.

About 30 species, chiefly in tropical South America; two others have been reported from Central America and a fourth from the Lesser Antilles.

Fig. 77. *Pterolepis pumila*

1. PTEROLEPIS PUMILA (Bonpl.) Cogn. in Mart. Fl. Bras. 14^3:263. 1885.

Rhexia pumila Humb. & Bonpl. Rhex. *t. 35.* 1823.

Erect, freely branched, 1–6 dm. tall; stem strigose, the hairs geniculate or prolonged at base; petioles densely strigose, 1–5 mm. long; leaf-blades firm, lanceolate to elliptic or ovate, 20–45 mm. long, 6–17 mm. wide, acute or acuminate, rounded or obtuse at base, 3- to 5-nerved, pilose on both sides; flowers very numerous, terminating the stem and all its branches, soon appearing lateral from proliferation, on pedicels 1–3 mm. long; hypanthium narrowly campanulate, 3–3.5 mm. long at anthesis, pilose, some hairs usually with a stout stalk 0.5–1 mm. long and 3–6 slender terminal branches; sepals erect, persistent, ovate-lanceolate, long-ciliate, acute; petals pink, obovate, 4–5 mm. long, glandular-ciliate; filaments 2–2.5 mm. long; episepalous anthers 1–2 mm. long, narrowly oblong, truncate, the connective prolonged 1 mm. or less and bearing two minute lobed or short anterior spurs at its base; fruiting hypanthium 5 mm. long.

Southern Mexico southward through Central America and widely distributed in northern South America.

COCLÉ: El Valle de Antón, 600–800 m., *Allen 2860*. PANAMÁ: vicinity of Pacora, about 35 m., *Allen 988*; San José Island, *Johnston 824, 889*. PROVINCE UNKNOWN: *Halsted*.

16. TIBOUCHINA Aubl.

TIBOUCHINA Aubl. Pl. Guian. 1:445. *t. 177*. 1775.

Flowers 4- to 8-merous. Hypanthium tubular to broadly campanulate, thin-walled, often costate at maturity. Calyx-tube briefly prolonged, usually erect; sepals erect, spreading, or recurved, ovate to linear, small or large; exterior teeth none. Petals usually ciliate. Stamens isomorphic to strongly dimorphic. Filaments terete or flattened, in some species pubescent or glandular. Anthers subulate, linear, or narrowly ellipsoid or oblong, 2-celled; connective more or less prolonged at base and bearing two anterior lobes or short appendages. Ovary free, its locules isomerous with the petals, its summit pubescent or setose and often glandular. Style elongate, straight, sigmoid, or bent at the summit; stigma punctiform. Capsule 4- to 8-valved, enclosed by the persistent hypanthium. Seeds minute, cochleate, tuberculate. Herbs or shrubs, almost all pubescent or lepidote; leaves isomorphic; flowers medium-sized to large, sometimes enclosed by bracts, solitary or in terminal or axillary cymes; hairs of the upper leaf-surface adnate to the epidermis for a part of their length.

At least 250 species, most numerous in southern Brazil and in the Andes of Bolivia and Peru; about thirty species occur in other parts of Central America and Mexico and four in the West Indies.

a. Flowers 4-merous.
  b. Sepals triangular-lanceolate, 4.5–5 mm. long; connective of the episepalous stamens prolonged about 2 mm., much longer than that of the inner series ..... 1. T. OERSTEDII.
  bb. Sepals triangular-ovate, 2–3 mm. long; connectives of both series of stamens about equal ..... 2. T. NANA.
aa. Flowers 5-merous.
  b. Stem and hypanthium lepidote; connective pilose ..... 3. T. BIPENICILLATA.
  bb. Stem and hypanthium pubescent; connective glabrous ..... 4. T. LONGIFOLIA.

1. TIBOUCHINA OERSTEDII (Triana) Cogn. in Mart. Fl. Bras. 14^3:297. 1885.

Pterolepis oerstedii Triana, in Trans. Linn. Soc. 28:40. 1871.

Stems loosely spreading, freely branched, decumbent or prostrate, sharply 4-angled, thinly strigose; petioles 3–6 mm. long; leaf-blades ovate, 1.5–3 cm. long by half as wide, acute, entire, acute or broadly cuneate at base, 5- to 7-pli-nerved, densely and softly pubescent above, more thinly so beneath; flowers usually few, on slender peduncles 2–3 cm. long; hypanthium narrowly campanulate-obconic, 4–4.5 mm. long, narrowly 4-winged, with 4 intermediate ribs, glabrous or setose on the sides, strigose on the wings, more or less setose at the summit; sepals triangular-lanceolate, 4.5–5 mm. long, spreading, acuminate, 1-nerved, densely ciliate, tipped with a stout seta 1–2 mm. long; petals narrowly obovate or almost spatulate, 11–

12 mm. long; filaments 5 or 4.3 mm. long; thecae linear-subulate, 5–5.5 or 3–3.5 mm. long; connective 2–2.5 or 0.7 mm. long, with two small, rounded, anterior lobes; ovary 4-celled, setose at the summit; style 8–10 mm. long.

Costa Rica, Panama, and northern Colombia.

CHIRIQUÍ: vicinity of Boquete, 1200–1500 m., *Woodson & Schery 769*. COCLÉ: vicinity of El Valle, *Allen 757*. PROVINCE UNKNOWN: *Pittier 5355*.

2. TIBOUCHINA NANA (Standley) Gl. in Phytologia 1:133. 1935.

Chaetolepis nana Standley, in Field Mus. Publ. Bot. 4:247. 1929.

Stems herbaceous, ascending, 2–3 dm. long, forming dense mats, the branches sparsely villous; petioles flattened, appressed-setose, 4–8 mm. long; leaf-blades thin, ovate to broadly elliptic, 10–25 mm. long, 6–15 mm. wide, acute, entire, broadly cuneate at base, 5- to 7-pli-nerved, above shortly soft-villous and sparsely setose, beneath subsericeous; flowers solitary, terminating the branchlets, on slender pedicels 5–8 mm. long; hypanthium obconic, 4–6 mm. long, obscurely 4-angled, sparsely pubescent; sepals ovate, 2–3 mm. long, ciliate; petals purple, 5–6 mm. long; stamens dimorphic; filaments 3.7 or 2.4 mm. long; thecae straight, 3.2 or 2.1 mm. long; connectives 0.6 or 0.3 mm. long, including the rounded basal appendages.

Costa Rica and Panama.

BOCAS DEL TORO: Almirante region, *Cooper 232, 233*.

3. TIBOUCHINA BIPENICILLATA (Naud.) Cogn. in Mart. Fl. Bras. 14^3:385. 1885.

Lasiandra bipenicellata Naud. in Ann. Sci. Nat. Bot. III 13:156. 1849.

Stems erect, woody, sparsely branched, obscurely 4-angled, scabrous with brown, appressed, lanceolate scales; petioles 6–12 mm. long; leaf-blades subcoriaceous, oblong-lanceolate to ovate-oblong, 6–15 cm. long, 2–7 cm. wide, acute, rounded at base, 5-nerved, the lateral nerves separate, strigose above, beneath coarsely strigose on the nerves, softly pubescent on the surface; inflorescence many-flowered, 5–10 cm. long, becoming lepidote above; bracts broadly ovate, 1–3 mm. long; pedicels 1–3 mm. long; hypanthium narrowly campanulate, 8 mm. long, silvery or cinereous with appressed lanceolate scales; sepals erect or nearly so, triangular, about 3 mm. long, acute; petals triangular-obovate, purple, about 1 cm. long; stamens dimorphic; filaments about 1 cm. long, often pilose distally, thecae subulate, arcuate, 9–10 or 7 mm. long; connectives slender, prolonged 3.5 or 2 mm. to the filament, their appendages slender, 1–2 mm. long, densely long-pilose; style about 16 mm. long.

Costa Rica, Panama, Colombia, and Venezuela.

CHIRIQUÍ: Cerro Vaca, *Pittier 5304*. VERAGUAS: vicinity of Santiago, 50 m., *Allen 1013*.

4. TIBOUCHINA LONGIFOLIA (Vahl) Baill. in Adansonia. 12:74. 1877.

Rhexia longifolia Vahl Eclog. Am. 1:39. 1796.

Fig. 78. *Tibouchina longifolia*

Stems woody, erect, freely branched, densely pilose with stout, appressed, ascending, or spreading hairs mostly 1.5–3 mm. long; petioles slender, 5–20 mm. long; leaf-blades thin to firm, ovate-oblong to narrowly lanceolate, 3–10 cm. long, 1–3 cm. wide, acute or acuminate, essentially entire, at base narrowly to broadly cuneate or rarely obtuse, 5-nerved, the lateral nerves confluent toward the base, densely or sparsely, usually stiffly, pilose above, beneath softly villous on the surface, more or less strigose on the veins; flowers in small cymes terminating the stem and branches, often very numerous, forming large panicles; hypanthium broadly campanulate, 3–3.5 mm. long, 10-ribbed, densely setose, the hairs mostly ascending; sepals triangular-subulate to linear, setose and ciliate, shorter than, equaling, or slightly exceeding the hypanthium, usually recurved; petals white or purplish, 5–7 mm. long; stamens nearly isomorphic; thecae straight, 2–3 or 1.5 to 2.5 mm. long; connectives straight or curved, 0.3–0.7 mm. long, including the small or minute basal lobes; fruiting hypanthia nodding.

Southern Mexico to Panama and southward to Brazil and Bolivia; Cuba, Hispaniola, and occasional, possibly introduced in other parts of the West Indies; the most abundant and most widely distributed species of the genus.

BOCAS DEL TORO: *Carleton 127*; Changuinola Valley, Potrero Island, *Dunlap 73*. CANAL ZONE: Barro Colorado Island, *Aviles 105*, *Woodworth & Vestal 672*; Gatún, *Hayes 3*; Chagres, *Fendler 129*. CHIRIQUÍ: Boquete, *Davidson 626*, *Terry & Terry 1650*. COCLÉ: Valle de Antón, 600–800 m., *Allen 2855*. DARIÉN: Chepigana district, *Terry & Terry 1392*; Cana and vicinity, *Williams 733*. PANAMÁ: vicinity of San Carlos, 0–10 m., *Allen 1147*.

17. MONOLENA Triana

MONOLENA Triana, in Benth. & Hook. Gen. Pl. 1:756. 1867.

Flowers 5-merous. Hypanthium obconic, glabrous, 3-angled. Calyx-lobes short, obtuse. Petals obovate, ephemeral. Stamens nearly isomorphic, somewhat unequal in size; anthers linear or narrowly oblong, obtuse; connective prolonged below the thecae, minutely tuberculate dorsally at base, extended below the summit of the filament into a single ventral spur. Capsule trigonous, expanded laterally into a triangular summit depressed at the center; seeds obpyramidal. Rhizomatous herbs, often epiphytic, the leaves apparently all basal, one member of each pair minute and rarely persistent at anthesis; flowers few, pink or white, sessile in a secund spike on an elongate scape.

Possibly 6 or 8 species, all poorly known and inadequately represented in herbaria, ranging from Guatemala to Peru.

1. MONOLENA OVATA Cogn. in Bull. Acad. Belg. III. 14:945. 1887.

Plant glabrous; petioles 1–1.5 dm. long; leaf-blades ovate, 1.5–2.5 dm. long, about three-fifths as wide, abruptly short-acuminate, broadly rounded at the base, 7-pli-nerved; scapes 2–4 dm. tall; spikes 4–6 cm. long, 3- to 5-flowered; petals white, bordered with pink, about 2.5 cm. long; capsule about 1 cm. wide.

Panama and Colombia.

DARIÉN: crest of the Cana–Cuasi trail, 1650 m., *Terry & Terry 1543*.

18. DIOLENA Naud.

DIOLENA Naud. in Ann. Sci. Nat. Bot. III. 15:329. 1851.

Closely resembling *Triolena* in the structure of the inflorescence, fruit, and flowers, differing in the anthers which bear only two ventral spurs. Shrubs or herbs, often of considerable size, in most species with strongly dimorphic leaves.

About 10 species of Andean South America and Amazonia, extending north in Central America as far as Guatemala.

1. DIOLENA SPICATA Triana, in Trans. Linn. Soc. 28:81. 1871.

Shrub to 2.5 m. tall with densely strigose stems; larger leaves oblanceolate, acuminate, ciliate, denticulate above the middle, at base oblique and cordulate, tending to be convex on one margin toward the base and concave on the other, sparsely setose on both sides, 5-pli-nerved, the inner pair of nerves alternate; petiole 2–4 mm. long; smaller leaves deflexed, reniform, 4–8 mm. wide; spikes up to 10 cm. long.

Fig. 79. *Monolena ovata*

Western Colombia and Panama.

BOCAS DEL TORO: Water Valley, *von Wedel 1510*.

19. TRIOLENA Naud.

TRIOLENA Naud. in Ann. Sci. Nat. Bot. III. 15:328. 1851.

Flowers 5-merous. Hypanthium thin-walled, cup-shaped, usually strigose. Sepals small; exterior teeth present and projecting. Petals small, ephemeral. Stamens isomorphic, but some frequently partly abortive; anthers linear; connective prolonged briefly at base and bearing three filiform or clavellate, ventral spurs, each of them about as long as the anther and two of them usually curved-ascending past the anther. Ovary 3-celled, superior. Fruit a 3-celled capsule of peculiar structure; outer walls of the ovary growing laterally into three prominent longitudinal wings and distally much beyond the actual summit of the ovary; upper part of the ovary expanding into three slender lobes extending into the wings; dehiscence apparently circumscissile between the summit of the ovary and the lateral walls; capsule invested to its margin by the accrescent calyx. Seeds minute, pyramidal, not cochleate. Caulescent shrubs with small flowers in dense secund

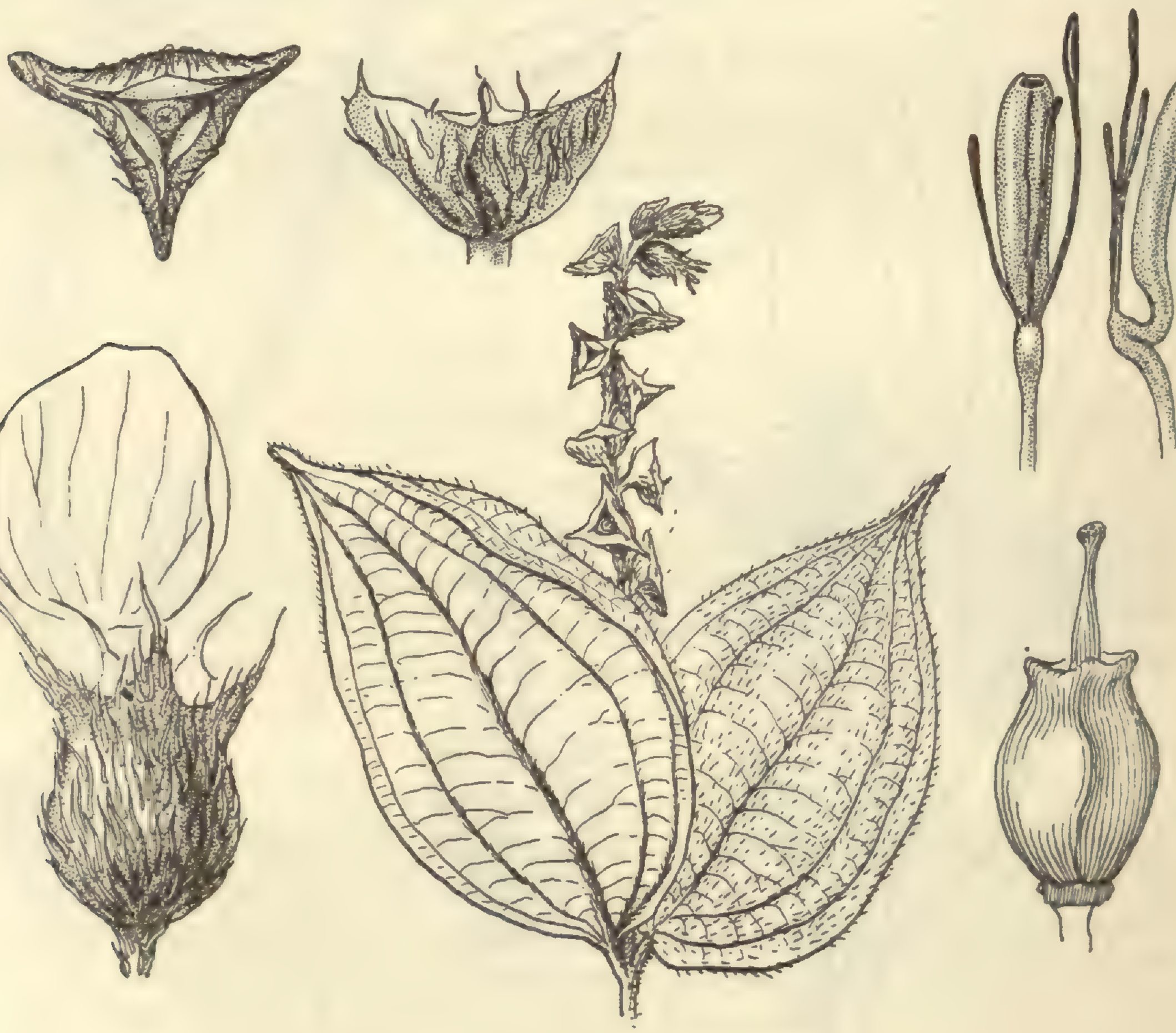

Fig. 80. *Triolena hirsuta*

spikes or spike-like racemes; leaves isomorphic but often unequal, the smaller one of each pair often deciduous.

About 8 species, chiefly in the mountains from southern Mexico to Peru. Flowers are rarely collected and the species are not well understood.

1. TRIOLENA HIRSUTA (Benth.) Triana, in Trans. Linn. Soc. 28:81. 1871.

Bertolonia hirsuta Benth. Bot. Voy. Sulphur 94. 1844.

Shrub up to 5 dm. tall; leaves essentially isomorphic; petioles strigose, 1–2 cm. long; leaf-blades elliptic or oblong, 5–15 cm. long, half to two-thirds as wide, abruptly acuminate, entire, rounded or broadly obtuse at base, 5- to 7-nerved, hirsutulous above, beneath strigose on the principal veins, sparsely pilose on the veinlets, glabrous on the surface; spike terminal, short-peduncled, 3–6 cm. long, densely flowered, secund; hypanthium strigose, about 2.5 mm. long; petals white, about 3 mm. long; capsule about 7 mm. wide.

Guatemala to Panama.

BOCAS DEL TORO: Water Valley, *von Wedel 702, 922*; Pumpkin River, *von Wedel 2568*; vicinity of Chiriquí Lagoon, *von Wedel 1020, 2613*; vicinity of Nievecita, 0–50 m., *Woodson, Allen & Seibert 1825*; without locality, *von Wedel 146, 291*; Changuinola Valley, *Dunlap 279, 558*. COCLÉ: vicinity of El Valle de Antón, 500–1000 m., *Allen 1204, Seibert 461*. DARIÉN: Chepigana district, 600 m., *Terry & Terry 1415, 1633*; Cana and vicinity, *Williams 757*. PROVINCE UNKNOWN: *Rowlee & Stork 1022*.

20. BLAKEA P. Br.

BLAKEA P. Br. Hist. Jamaic. 323. 1756.

Flowers usually 6-merous, each closely subtended by two pairs of bracts. Hypanthium campanulate or cup-shaped, usually thick-walled. Calyx truncate to deeply lobed. Petals usually large, commonly unsymmetrical. Stamens isomorphic; filaments short; anthers coherent in a ring, short, oval or oblong, abtuse or rounded at the summit, laterally flattened, opening by two minute pores; connective usually slightly prolonged or dilated at base into a dorsal spur. Ovary wholly inferior, usually 6-celled; stigma punctiform or capitate. Woody plants, often epiphytic or climbing by adventitious roots when young, sometimes reaching a large size, with conspicuous flowers solitary or fascicled in the axils of the leaves; leaves with the secondary veins usually close together, straight, and parallel.

At least 50 species, most numerous in the northern Andes; several others occur in other parts of Central America.

a. Bracts, both outer and inner pairs, connate almost to the summit.
  b. Bracts glabrous externally or essentially so..... 1. B. WOODSONII.
 bb. Bracts densely pubescent to hirsute externally.
  c. Petals coarsely tuberculate; sepals tipped with a reflexed foliaceous appendage; younger stems glabrous or merely furfuraceous..... 2. B. CALYCOSA.
  cc. Petals not tuberculate; sepals unappendaged; younger stems pubescent to hirsute.
   d. Flowers sessile; leaf-veins beneath coarsely hirsute..... 3. B. CRINITA.
   dd. Flowers on pedicel 5–20 mm. long; leaf-veins merely pubescent beneath..... 4. B. BRUNNEA.

Fig. 81. *Blakea woodsonii*

aa. Outer bracts, and usually also the inner, separate to the base. (Since the pedicel passes imperceptibly into the hypanthium, they may appear to be connate for a small part of their length.)
  b. Outer bracts conspicuously longer than the hypanthium and calyx combined.
    c. Calyx truncate, the lobes represented by 6 minute tubercles; pedicels glabrous; secondary veins about 0.5 mm. apart..... 5. B. GRACILIS.
    cc. Calyx-lobes manifest, triangular with concave sides, about 1.5 mm. long; pedicels stout, pubescent; secondary veins 1–1.5 mm. apart..... 6. B. FOLIACEA.
  bb. Outer bracts distinctly shorter than the hypanthium.
    c. Calyx truncate, the lobes represented by minute tubercles..... 7. B. PAUCIFLORA.
    cc. Calyx-lobes triangular, acute..... 8. B. PARVIFOLIA.

1. BLAKEA WOODSONII Gl. ex Woods. & Seib. in Ann. Mo. Bot. Gard. 26:296. 1939.

Shrub or small tree to 9 m. tall, the younger branches and petioles smooth to sparsely furfuraceous-hispid; petioles 1–3 cm. long; leaf-blades oblong-obovate to obovate, 7–12 cm. long, half to two-thirds as wide, rounded to a small triangular apex, entire, broadly cuneate to obtuse at base, glabrous above, essentially glabrous beneath, 3-nerved or barely 3-pli-nerved; pedicels solitary or rarely paired, stout, 1–5 cm. long; bracts connate nearly to the summit, the outer 12 mm. long, the inner about 15 mm., glabrous or nearly so at anthesis; petals white, 2.5–4 cm. long; anthers flattened, rounded, 5–7 mm. long.

Endemic to Panama.

CHIRIQUÍ: cloud forest on Cerro Horqueta, 1950 m., *von Hagen & von Hagen 2045, 2028, 2071*; vicinity of Casita Alta, Volcán de Chiriquí, 1500–2000 m., *Woodson, Allen & Seibert 951*; Casita Alta to Cerro Copete, 2300–3300 m., *Woodson & Schery 370*; vicinity of Bajo Mona and Quebrada Chiquero, 1500 m., *Woodson & Schery 573*; vicinity of Cerro Punta, 2000 m., *Allen 3483*; summit and southwest face of Cerro Copete, 2700 m., *Allen 4907*; Cerro Punta to headwaters of Río Caldera, 2250–2500 m., *Allen 1454*; Bajo Chorro, 2100 m., *Davidson 401, 401A, 401B*; Bajo Chorro, 1800 m., *Davidson 175*.

2. BLAKEA CALYCOSA Gl. in Phytologia 1:342. 1939.

Epiphytic shrub, the younger stems, petioles and leaf-blades glabrous or thinly furfuraceous; petioles rather slender, 2–4 cm. long; leaf-blades thin, elliptic, up to 25 cm. long, about a third as wide, abruptly and shortly caudate, acuminate, rounded at base, 3-nerved with an additional pair of marginal nerves; flowers few in the axils, on pedicels about 5 mm. long; bracts connate to the middle, pubescent on the outside and distally on the inside; calyx-tube widely spreading; sepals terminated by a foliaceous, reflexed, folded, broadly ovate, pubescent appendage; petals rose-red, 2–2.5 cm. long, tuberculate on both sides; anthers broadly elliptic, about 5 mm. long, the connective bearing a short, obtuse, basal spur.

Known only from the type specimen.

COCLÉ: north rim of El Valle de Antón, 600–1000 m., *Allen 1788*.

3. BLAKEA CRINITA Gl. in Phytologia 3:356. 1950.

Shrubs 3–6 m. tall, the younger stems and petioles densely long-hirsute; petioles very stout, 1–3 cm. long; leaf-blades coriaceous, broadly elliptic, up to 14 cm. long and 11 cm. wide, rounded at both ends, 5-nerved with an additional pair of

marginal veins, glabrous above, beneath densely long-hirsute on the principal veins, less so on the veinlets, and sparsely pilose on the surface; flowers solitary or paired, sessile or subsessile; bracts connate, densely hirsute with hairs about 4 mm. long; petals pink, about 2 cm. long; anthers broadly elliptic, about 6 mm. long, the connective bearing a very minute dorsal spur.

Known only from the type specimen.

COCLÉ: crest of Cerro Pajita, north of El Valle, 1200 m., *Allen 3956*.

4. BLAKEA BRUNNEA Gl. ex Woods. & Schery, in Ann. Mo. Bot. Gard. 28:435. 1941.

Tree to 12 m. tall or perhaps taller, also reported as an epiphyte, the younger stems, petioles, pedicels, and sepals coarsely pubescent; petioles stout, 3–6 cm. long; leaf-blades subcoriaceous, elliptic or elliptic-ovate, up to 25 cm. long and 15 cm. wide, acute or apiculate, broadly rounded at base, glabrous above, brown and glabrous on the surface beneath at maturity, permanently pubescent on the veins, 5-nerved, the outer pair diverging at right angles from the midvein and together forming the arc of a circle; pedicels solitary or rarely paired, stout, 1–2 cm. long; bracts connate, about 25 mm. long; petals large, white; anthers broadly rounded, about 7 mm. long.

Endemic to Panama.

CHIRIQUÍ: Bajo Chorro, Boquete District, 2100 m., *Davidson 332*; cloud forest on Cerro Horqueta, 1950 m., *von Hagen & von Hagen 2131*; Robalo Trail, northern slopes of Cerro Horqueta, 1800–2100 m., *Allen 4988*; vicinity of Bajo Chorro, 1900 m., *Woodson & Schery 618*.

5. BLAKEA GRACILIS Hemsl. Diagn. Plant. Nov. 13. 1878.

Epiphytic shrub or vine, also becoming an independent tree and reported 12 m. tall, glabrous or nearly so; petioles 5–12 mm. long; leaf-blades commonly obovate-oblong, 5–10 cm. long, two-fifths to three-fifths as wide, rather gradually acuminate to a slender tip, cuneate to the base, apparently 3-pli-nerved but with another pair of submarginal veins; secondary veins about 0.5 mm. apart; pedicels solitary, slender, glabrous, 3–6 cm. long; outer bracts ovate, foliaceous, 2–3 cm. long, many-nerved, much exceeding the inner ones and the calyx; calyx truncate, the lobes represented by minute tubercles only; petals pink, broadly and obliquely obovate, 1.5–2 cm. long.

Costa Rica and Panama.

BOCAS DEL TORO: Robalo trail, northern slopes of Cerro Horqueta, 1800–2100 m., *Allen 4990*. CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, vicinity of Cerro Punta, *White 37, 154, 336, White & White 84*; trail from Bambito to Cerro Punta, 1400–2300 m., *Allen 315*; vicinity of New Switzerland, central valley of Río Chiriquí Viejo, 1800–2000 m., *Allen 1354*.

6. BLAKEA FOLIACEA Gl. in Phytologia 3:355. 1950.

Tree up to 18 m. tall, the younger stems, petioles, and pedicels closely red-brown-pubescent; petioles slender, 1–2 cm. long; leaf-blades oblong or oblong-

elliptic, 8–14 cm. long, about half as wide, abruptly acuminate to a slender tip, obtuse to rounded at base, glabrous, 5-pli-nerved, the secondary veins 1–1.5 mm. apart; peduncles stout, solitary, 3–6 cm. long; bracts foliaceous, spreading, separate to the base, the outer about 3 cm. long, 2 cm. wide, the inner somewhat smaller; calyx-lobes manifest, depressed-triangular; petals very obliquely cuneate-obovate, white, about 3 cm. long.

Endemic.

BOCAS DEL TORO: Fish Creek, vicinity of Chiriquí Lagoon, *von Wedel 2219*; Fish Creek Mountains, *von Wedel 2277*. COCLÉ: vicinity of La Mesa, altitude 1000 m., *Allen 2312*.

7. BLAKEA PAUCIFLORA Gl. in Phytologia 3:357. 1950.

Small tree 6–7 m. tall, glabrous throughout. Petioles 8–10 mm. long. Leaf-blades broadly elliptic-obovate, up to 5 cm. long and 3 cm. wide, rounded above to an apiculum 6–10 mm. long, broadly cuneate at base, 5-nerved. Flowers solitary in the axils on pedicels about 2 cm. long. Bracts separate to the base, broadly triangular, the outer 2.5 mm. long, the inner a little longer. Hypanthium 3 mm. long. Calyx widely flaring, almost truncate, its lobes reduced to minute tubercles. Petals white, semi-obovate, 9 mm. long. Anthers broadly oval, 2.5–3 mm. long, the connective neither elevated nor spurred.

Known only from the type specimen.

CHIRIQUÍ: foot of Sierra del Boquete, *Maurice 744*.

8. BLAKEA PARVIFOLIA Gl. in Phytologia 3:357. 1950.

Small tree, up to 10 m. tall, glabrous throughout. Petioles 5–8 mm. long. Leaf-blades cuneate-obovate, 2.5–4 cm. long, about half as wide, rounded above to a short apiculum, long-cuneate at base, 3-nerved. Flowers solitary in the axils on pedicels about 1 cm. long. Bracts separate to the base, oblong-ovate, very blunt, much shorter than the hypanthium. Hypanthium almost spherical, 3 mm. long. Calyx-lobes depressed triangular, about 1 mm. long, acute. Petals pink, oblong-obovate, 8–9 mm. long. Anthers semi-ovate, about 3 mm. long, the connective neither elevated nor spurred.

Known only from the type specimen.

COCLÉ: crest of Cerro Pajita, El Valle de Antón, 1100 m., *Allen 3761*.

21. TOPOBEA Aubl.

TOPOBEA Aubl. Pl. Guian. 1:476. *t. 189*. 1775.

Stamens isomorphic; filaments relatively short; anthers coherent in a ring, often laterally flattened, subulate or lanceolate, often somewhat cleft at the summit, opening by two minute pores; connective in most species prolonged straight back into a short, slender, dorsal spur. Otherwise precisely as in *Blakea*.

Probably 50 species of northern South America and Central America, especially

in regions of high rainfall. Every type of leaf, inflorescence, bract, and calyx known in the genus occurs also in *Blakea*, and the two genera can be accurately distinguished only by the anthers. Besides the species described below, *T. superba* Naud. was reported from Panama by Cogniaux. No specimen has been seen, during the preparation of this treatment, which can be referred to it.

a. Leaves sessile or subsessile, rounded to cordate at base.
  b. Blades oblong or oblong-obovate, obtuse, obscurely 3-nerved; younger parts pubescent; pedicels 2–4 cm. long..... 1. T. ELLIPTICA.
  bb. Blades cordate-ovate, 5-nerved; plant glabrous; flowers sessile or subsessile..... 2. T. CORDATA.
aa. Leaves distinctly petioled.
  b. Outer bracts acute to acuminate, distinctly surpassing the inner ones.
    c. Younger parts pubescent with barbellate hairs up to 1 mm. long; sepals 2–4 mm. long..... 3. T. UROPHYLLA.
    cc. Younger parts barely furfuraceous.
      d. Leaves thin and dull, pli-nerved; secondary veins about 1 mm. apart; calyx-lobes minute..... 4. T. PLUVIALIS.
      dd. Leaves shining, 3-nerved, secondary veins 0.3–0.5 mm. apart; calyx at anthesis ruptured nearly to the torus..... 5. T. COOPERI.
  bb. Outer bracts broadly rounded at the summit, equaling or shorter than the inner.
    c. Flowers appearing when the leaves are lacking or at least not fully expanded; sepals triangular-ovate..... 6. T. PRAECOX.
    cc. Flowers appearing while the leaves are fully expanded; sepals almost obsolete.
      d. Leaves thinly coriaceous; flowers 1–2 per leaf axil on pedicels 3–6 mm. long..... 7. T. REGELIANA.
      dd. Leaves membranaceous; flowers 4–6 per leaf axil on pedicels 10–15 mm. long..... 8. T. MEMBRANACEA.

1. TOPOBEA ELLIPTICA Gl. in Phytologia 3:353. 1950.

Epiphytic shrub about 2 m. tall, the younger parts sparsely pubescent with both simple and glandular hairs; leaves sessile, oblong or obovate-oblong, up to 7 cm. long and 4.5 cm. wide, rounded at the summit, subcordate and clasping at base, 3-nerved; pedicels solitary in the axils, up to 4 cm. long; flowers small; bracts foliaceous, separate to the base, broadly rounded, about equaling the hypanthium; sepals triangular, recurved after anthesis.

Endemic.

BOCAS DEL TORO: Robalo trail, northern slopes of Cerro Horqueta, 1800–2100 m., *Allen 5001*.

2. TOPOBEA CORDATA Gl. in Phytologia 3:354. 1950.

Small epiphytic shrub, glabrous throughout; leaves sessile, ovate, up to 8 cm. long, about two-thirds as wide, acute, broadly rounded to the subcordate base, 5-nerved with an additional pair of marginal veins; flowers solitary in the axils, on pedicels about 1 mm. long; bracts free to the base, broadly elliptic, rounded at both ends, the outer subcoriaceous, about 11 by 8 mm., the inner thinner, somewhat smaller; hypanthium nearly 4 mm. long; sepals broadly elliptic-ovate, somewhat imbricate at base, about 4 mm. long and 3 mm. wide.

Endemic.

COCLÉ: Cerro Pajita, hills north of El Valle de Antón, 1000–1200 m., *Allen & Allen 4178*.

3. TOPOBEA UROPHYLLA Standl. in Field Mus. Pub. Bot. 22:162. 1940.

Shrub to 3.5 m. tall, the younger parts, petioles, and peduncles pubescent with short, stout, rough hairs; petioles 1–2 cm. long; leaf-blades oblong or elliptic, up to 13 cm. long, about half as wide, abruptly acuminate to a slender tip, rounded to broadly obtuse at base, 5-pli-nerved, the outer pair of nerves submarginal, glabrous above, sparsely pubescent on the veins beneath; pedicels solitary or few in each axil, 4–8 mm. long; bracts separate to the base, thinly stellate-pubescent, the outer ovate, acuminate, about equaling the hypanthium, the inner slightly shorter; hypanthium stellate-pubescent; calyx-lobes triangular-ovate, 1.5–2.5 mm. long; Petals pale pink, about 1 cm. long, pubescent externally.

Nicaragua and Panama.

DARIÉN: Río Balsa, above Tucutí, 30 m., *Terry & Terry 1411*; Cana-Cuasi trail, Chepigana district, 1200 m., *Terry & Terry 1517*.

4. TOPOBEA PLUVIALIS Standl. in Field Mus. Pub. Bot. 22:162. 1940.

Shrub up to 3.5 m. tall, the younger parts minutely furfuraceous, otherwise glabrous throughout; internodes frequently clavate-thickened; petioles 1–2 cm. long; leaf-blades elliptic to broadly oblanceolate, up to 17 cm. long, about two-fifths as wide, acuminate to a slender tip, cuneate to the base, 5-pli-nerved, the outer pair submarginal; flowers solitary or few in the axils, on pedicels 1–1.5 cm. long; bracts free to the base, the outer acuminate, about equaling the hypanthium, the inner somewhat shorter; calyx nearly truncate at the summit, the lobes represented by six minute teeth; petals white, about 1 cm. long.

Endemic.

DARIÉN: Cana-Cuasi trail, Chepigana District, 1200–1650 m., *Terry & Terry 1557, 1560*.

5. TOPOBEA COOPERI Gl. in Phytologia 3:354. 1950.

Small epiphytic shrub, glabrous except on the youngest parts and the bracts; stems thickened at the nodes; petioles stout, 1–2 cm. long; leaf-blades elliptic to elliptic-obovate, up to 10 cm. long, half to two-thirds as wide, abruptly narrowed to a short slender tip, very broadly cuneate at base, 3- to 5-nerved or barely 3-pli-nerved, the secondary veins 0.6 mm. apart; pedicels fascicled in the axils, 2–11 mm. long; bracts distinct, thinly furfuraceous, the outer oblong-obovate, acute, 8 mm. long, the inner broadly rounded at the summit, about two-thirds as long; hypanthium glabrous, 6 mm. long; calyx nearly closed in bud, at anthesis irregularly ruptured; petals pink, about 12 mm. long, unsymmetrically oblanceolate.

Endemic.

BOCAS DEL TORO: Cricamola valley, region of Almirante, *Cooper 199*. COCLÉ: vicinity of La Mesa, north of El Valle de Antón, about 1000 m., *Allen 2837*.

Fig. 82. *Topobea praecox*

6. TOPOBEA PRAECOX Gl. in Phytologia 3:355. 1950.

Shrub or tree 6–20 m. tall, with thick stems and on the flowering branches very short internodes; leaves lacking or very immature at anthesis; petioles 1–2 cm. long; leaf-blades elliptic, certainly up to 10 cm. long and about three-fifths as wide, abruptly acuminate, broadly cuneate to subrotund at base, 5-nerved, the secondary veins 1–2 mm. apart; flowers several in a fascicle, on slender pedicels up to 1 cm. long; bracts distinct to the base, nearly equal, rotund or even wider than long, 7–8 mm. long, glabrous or nearly so; hypanthium 4–5 mm. long; sepals depressed-ovate, rounded at the summit, 3–3.5 mm. long from the torus; petals rose-purple, narrowly and obliquely obovate, about 17 mm. long.

COCLÉ: vicinity of La Mesa, north of El Valle de Antón, 1000 m., *Allen 2788*; vicinity of El Valle de Antón, 600 m., *Allen 2067, 1742*. DARIÉN: trail between Pinogana and Yavisa, about 15 m., *Allen 294*.

7. TOPOBEA REGELIANA Cogn. in DC. Monogr. Phan. 7:1085. 1891.

Tree 10 m. tall, the youngest parts coarsely furfuraceous, otherwise glabrous; petioles slender, 2–4 cm. long; leaf-blades broadly elliptic to obovate-rotund, up to 11 cm. long, half to three-fourths as wide, apiculate, obtuse to subrotund at base, 5-nerved, the outer pair submarginal, the secondary veins 2–3 mm. apart; flowers solitary or paired, on pedicels 3–6 mm. long; bracts distinct to the base, the outer obovate-oblong, obtuse, 4–6 mm. long, the inner much broader and

slightly longer; hypanthium about 7 mm. long; calyx nearly erect, about 2 mm. long, its lobes obscure or obsolete.

Panama and probably also Costa Rica.

CANAL ZONE: vicinity of Salamanca Hydrographic Station, Río Pequení, 80 m., *Woodson, Allen & Seibert 1589*; Chagres, *Fendler 295*.

8. TOPOBEA MEMBRANACEA Wurdack, in Brittonia 9:108. 1957.

Tree or large vine, the young parts puberulous, the leaves as in *T. regeliana* but membranous rather than thin-coriaceous at anthesis; flowers 4–6 per upper leaf axil on slender pedicels about 1–1.5 cm. long, otherwise as in *T. regeliana*.

Eastern Panama to northwestern Colombia.

DARIÉN: Ensenada Guayabo, *Stern & Chambers 175*.

22. CLIDEMIA D. Don

CLIDEMIA D. Don, in Mem. Wern. Soc. 4:306. 1823.

Flowers 4- to 7-merous. Hypanthium cup-shaped to tubular; sepals erect or spreading, of various shapes and sizes, in some species obsolete; exterior teeth present, in many species exceeding and more or less concealing the sepals; petals small, obtuse, mostly white; stamens isomorphic; anthers subulate, linear, semi-ovoid, or rarely obovoid; connective usually simple, or briefly prolonged below the thecae, or rarely prolonged into a short dorsal appendage; ovary partly or wholly inferior, its cells commonly isomerous with the petals; style slender; stigma capitate to punctiform; fruit a globose many-seeded berry. Herbs, shrubs, or rarely even trees, with axillary flowers or flower-clusters of various types.

About 160 species, widely distributed throughout tropical America. Several other species are known from Costa Rica and some of them may be expected in Panama.

a. Flowers 5- to 7-merous.
  b. Leaves regularly dimorphic, one member of each pair always 2–12 times as long as the other.
    c. Leaves sessile, glabrous on both sides.
      d. Leaves obtuse or rounded at the base..... 1. C. GRACILIS.
      dd. Leaves cordate and clasping at base..... 2. C. PITTIERI.
    cc. Leaves short-petioled, more or less pubescent beneath..... 3. C. OBLONGA.
  bb. Leaves isomorphic (in lateral branches the leaves of each alternate pair may be somewhat unequal in size.).
    c. Torus bearing a ring of fimbriate or ciliate scales; hypanthium hirsute with simple hairs.
      d. Leaves pli-nerved, the inner pair of lateral veins usually alternate; blades usually acute or obtuse at base, averaging nearly three times as long as wide; connective not prolonged below the summit of the filament..... 4. C. DENTATA.
      dd. Leaves 5- to 9-nerved, usually rounded or subcordate at base, averaging less than twice as long as wide; connective minutely prolonged into a short dorsal spur..... 5. C. HIRTA.
    cc. Toral scales none.
      d. Inflorescence distinctly pedunculate, elongate, with a well defined central axis.

e. Principal leaves 7- to 9-nerved, cordate or rounded at base; anthers slenderly subulate, not convolute; connective prolonged 0.3–1 mm. between the thecae and the filament.
f. Exterior teeth conspicuously surpassing the sepals..... 6. C. STRIGILLOSA.
ff. Exterior teeth equaling or barely surpassing the sepals..... 7. C. NOVEMNERVIA.
ee. Principal leaves 5-nerved, obtuse or rounded at base; anthers stoutly subulate with convolute thecae; connective simple.
f. Leaves stellate-tomentose on the actual surface beneath..... 8. C. NEGLECTA.
ff. Leaves pubescent beneath with curled simple bristles which obscure or conceal the underlying stellate hairs.
g. Inflorescence elongate, the flexuous internodes mostly 1–2 cm. long, sparsely hirsute with simple hairs 1–3 mm. long and conspicuously glandular; hairs of the hypanthium mostly 1–3 mm. long..... 9. C. CAPITELLATA.
gg. Inflorescence short and compact, the internodes rarely as much as 1 cm. long, densely hirsute with simple hairs up to 6 mm. long and nearly or quite concealing the few glandular hairs; hairs of the hypanthium up to 6 mm. long..... 10. C. DEPENDENS.
dd. Inflorescence not distinctly pedunculate or elongate, or rarely with a short peduncle, more or less trichotomous from the base, without a distinct central axis.
e. Formicaria none; pubescence of the stem tomentose, hirsute, or substrigose.
f. Exterior teeth equaling or shorter than the sepals; stem and hypanthium hirsute above a dense furfuraceous tomentum..... 11. C. REITZIANA.
ff. Exterior teeth distinctly surpassing the sepals; young stems densely substrigose..... 12. C. DEPPEANA.
ee. Formicaria present on the petioles; pubescence of the stem reflexed-setose.
f. Lower leaf-surface glabrous, setose on the veins and veinlets; setae of the hypanthium 8–10 mm. long..... 13. C. COLLINA.
ff. Lower leaf-surface hirsute throughout; setae of the hypanthium about 3 mm. long..... 14. C. TAURINA.
aa. Flowers 4-merous.
b. Leaves or petioles bearing formicaria.
c. Formicaria pendent at the base of the petiole..... 15. C. TOCOCOIDEA.
cc. Formicaria at the summit of the petiole..... 16. C. SETOSA.
bb. Formicaria lacking.
c. Exterior teeth foliaceous, hispid-ciliate, equaling or exceeding the hypanthium; leaves strongly dimorphic..... 17. C. EPIPHYTICA.
cc. Exterior teeth conic to subulate, much shorter than the hypanthium.
d. Flowers sessile or nearly so in dense axillary clusters.
e. Leaves densely hirsute above, 5-pli-nerved..... 18. C. RUBRA.
ee. Leaves glabrous on the surface above, 3-nerved..... 19. C. DENSIFLORA.
dd. Flowers in branched cymes.
e. Leaves broadly ovate, acuminate..... 20. C. PURPUREO-VIOLACEA.
ee. Leaves elliptic, abruptly contracted into a slender linear apiculum 2–3 cm. long..... 21. C. OMBROPHILA.

1. CLIDEMIA GRACILIS Pittier, in Journ. Wash. Acad. Sci. 13:390. 1923.

Shrub, up to 1.5 m. tall, the younger stems flattened and two-edged, furfuraceous when young, later glabrous; leaves dimorphic, the larger sessile, ovate-lanceolate, 1–2 dm. long, 3–7 cm. wide, acuminate, entire, obtuse or rounded at base, 3-nerved, glabrous and shining above, puberulent on the veins beneath, the smaller leaves lanceolate, 1–3 cm. long, soon deciduous; inflorescences long-peduncled, much-branched, many-flowered, up to 18 cm. long; hypanthium campanulate, 3 mm. long; sepals scarcely differentiated, the exterior teeth stoutly subulate, scarcely surpassing the sepals; anthers linear, the connective

Fig. 83. *Clidemia pittieri*

prolonged briefly below the filament into a minute subrotund dorsal appendage.

Panama and Colombia.

BOCAS DEL TORO: Water Valley, *von Wedel 715, 962*; Fish Creek Mountains, *von Wedel 2339*. CANAL ZONE: lake shore along Gatún River valley, *Pittier 6748*. COCLÉ: El Valle, 500–700 m., *Seibert 467*; western slope and summit of Cerro Valle Chiquito, 700–800 m., *Seibert 498*. DARIÉN: Chepigana district, 600 m., *Terry & Terry 1439*.

2. CLIDEMIA PITTIERI Gl. in Bull. Torr. Bot. Club 68:252. 1941.

Shrub to 8 m. tall, glabrous throughout, the young stems terete; leaves sessile, cordate-clasping, abruptly acuminate, entire, strongly dimorphic, the larger ovate-lanceolate, 8–15 cm. long, 3–7 cm. wide, 5-nerved, the smaller broadly ovate to rotund, 2–3 cm. long, nearly or quite as wide; cymes pedunculate, trichotomous, 3–6 cm. long, few-flowered; flowers 5-merous; hypanthium subglobose, 3.3 mm. long; sepals about 0.6 mm. long, depressed-triangular; exterior teeth resembling the sepals but slightly smaller; petals red, subrotund, 4 mm. long; anthers thickly ovoid, the connective elevated into a prominent dorsal ridge.

Endemic to Panama, so far as known.

CHIRIQUÍ: southern slope of Cerro de la Horqueta, 1700 m., *Pittier 3177*; cloud forest, Cerro Horqueta, 1950 m., *von Hagen & von Hagen 2039*; Finca Lérida to Peña Blanca, 1750–2000 m., *Woodson & Schery 289*; vicinity of Bajo Mona and Quebrada Chiquero, 1500 m., *Woodson & Schery 562*; Bajo Chorro, Boquete district, 1800 m., *Davidson 397*.

3. CLIDEMIA OBLONGA Gl. in Brittonia 3:106. 1939.

Shrub climbing by roots; stems at first paleaceous, soon becoming glabrous; petioles paleaceous, about 4 mm. long; leaf-blades narrowly obovate-oblong, up to 18 cm. long and 7.5 cm. wide, one member of each pair about half as long as the other, short-acuminate, entire, narrowed to a rounded base, 3-nerved, glabrous above, glabrous beneath on the surface, paleaceous on the nerves; flowers in clusters 1–3 cm. long; hypanthium tubular, about 2.5 mm. long, very minutely puberulent; sepals very short, depressed semi-circular; anthers stoutly subulate, 2 mm. long, the connective prolonged below the filament into an ovate dorsal lobe 0.4 mm. long; ovary wholly inferior.

Known only from the type collection.

SAN BLAS: forests around Puerto Obaldía, San Blas coast, *Pittier 4304*.

4. CLIDEMIA DENTATA D. Don, in Mem. Wern. Soc. 4:308. 1823.

Shrub 1–4 m. tall, densely hirsute throughout with simple hairs; petioles stout, 1–1.5 cm. long; leaf-blades thin, oblong-ovate to ovate-lanceolate, often unequal in each pair, commonly 8–20 cm. long, 3–8 cm. wide, acuminate, entire or minutely serrulate, acute to rounded and usually oblique at base, sparsely pilose on both sides, 5-pli-nerved, the inner pair usually alternate; inflorescence 1–3 cm. long, few-flowered, short-stalked; hypanthium campanulate, about 3 mm. long; calyx truncate; exterior teeth subulate, erect, 2–5 mm. long, hirsute; petals white, obovate, 6–7 mm. long; filaments arcuate near the summit; anthers subulate, the connective not prolonged.

Southern Mexico to Panama, Bolivia, and southern Brazil.

BOCAS DEL TORO: Water Valley, *von Wedel 953*; Nances Cay, *von Wedel 582A*; Old Bank Island, *von Wedel 1915*; Sansan Swamp, Almirante region, *Cooper 192*; Changuinola Valley, *Dunlap 102a, 378*. CANAL ZONE: Chagres, *Fendler 37*; old Fort Lorenzo, mouth of Río Chagres, *Piper 5956*; Barro Colorado Island, *Woodworth & Vestal 607*, *Wilson 59*, *Aviles 912*; Cerro Ancón, *Heriberto 134*; between Mt. Hope and Santa Rita trail, *Cowell 75*. COCLÉ: Bismarck, *Williams 287*.

5. CLIDEMIA HIRTA (L.) D. Don, in Mem. Wern. Soc. 4:309. 1823.

Melastoma hirtum Linn. Sp. Pl. 390. *(Partim)*. 1753.

Shrub 1–3 m. tall, hirsute throughout with simple hairs; petioles 0.5–3 cm. long; leaf-blades ovate, 5–15 cm. long, often unequal in each pair, short-acuminate, serrulate or entire, rounded to subcordate at base, 5- to 7-nerved; flowers numerous in loosely branched cymes 3–5 cm. long, 5-merous or more commonly 6-merous; hypanthium campanulate, about 5 mm. long; calyx about 1 mm. long, truncate or obscurely lobed, the exterior teeth slender, projecting about 3 mm.; petals white, oblong-obovate, 8–11 mm. long; anthers about 5 mm. long, the connective minutely prolonged below the filament into a dorsal spur; ovary glabrous.

Southern Mexico, throughout the West Indies and Central America, southward in South America to Bolivia and southern Brazil; introduced as a weed in the Old World tropics.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 118*. CANAL ZONE: Ancón Hill, *Woodson, Allen, & Seibert 1334*, *Seibert 401*. PANAMÁ: near Arraiján, *Woodson, Allen & Seibert 1336*; Isla Taboga, *Woodson, Allen & Seibert 1546*.

6. CLIDEMIA STRIGILLOSA (Sw.) DC. Prodr. 3:159. 1828.

Melastoma strigillosa Sw. Prodr. Veg. Ind. Occ. 71. 1788.

Shrub 1–2 m. tall; stems densely stellate-tomentose and sparsely glandular. Petioles pubescent like the stem, about 1 cm. long. Leaf-blades firm, ovate-lanceolate, 8–14 cm. long, 3–6 cm. wide, acuminate, minutely serrulate, cordate or subcordate at base, 7-nerved, densely setose above, the hairs rising from conic bases, beneath reticulate-veined, densely stellate-tomentose, and more or less setose on the nerves; inflorescence with a distinct central axis 3–5 cm. long; flowers 5-merous; hypanthium hemispheric, 3 mm. long, glandular-hirsute and densely stellate-tomentose; sepals oblong, about 2 mm. long, surpassed by the subulate exterior teeth; petals white, 4–5 mm. long; ovary glandular-setose at the summit.

Guatemala, British Honduras, West Indies, and northern South America; reported from Panama.

7. CLIDEMIA NOVEMNERVIA (DC.) Triana, in Trans. Linn. Soc. 28:136. 1871.

Heterotrichum novemnervium DC. Prodr. 3:173. 1828.

Shrub, the stems and petioles densely stipitate-stellate-tomentose, also with spreading glandular hairs; petioles 1.5–4 cm. long; leaf-blades ovate to ovate-oblong, 10–15 cm. long, about half as wide, falcately acuminate, bullate-hirsute and sparsely stellate-pubescent above, beneath foveolate, densely stellate-tomentose;

inflorescence racemose, up to 10 cm. long, with a well developed central axis and stalked lateral branches; flowers sessile; hypanthium 4–4.5 mm. long, densely stellate-tomentose and glandular-hirsute; sepals round-ovate, 1–1.5 mm. long and about as wide; exterior teeth triangular, stellate on the back, barely surpassing the sepals; petals oblong-obovate, 4.5–5 mm. long; anthers subulate, 2.5–3 mm. long; connective very briefly prolonged below the thecae; ovary villous and glandular at the summit.

Costa Rica and Panama.

PANAMÁ: exact locality lacking, *Piper 5568*.

8. CLIDEMIA NEGLECTA D. Don, in Mem. Wern. Soc. 4:307. 1823.

Shrub 1–2 m. tall, densely glandular pubescent, stellate-tomentose, and also setose on the stems, petioles, inflorescence, and hypanthia; petioles 5–15 mm. long; leaf-blades oblong-ovate, rather thick, 7–15 cm. long, about half as wide, acuminate, serrulate, broadly rounded at base, 5-nerved, more or less rugose or bullate above, densely pubescent on both sides, more or less stellate beneath; hypanthium broadly tubular, densely stellate beneath the longer simple hairs; sepals oblong-ovate, 2.5–3 mm. long, slightly exceeded by the subulate exterior teeth; petals white or greenish, oblong-obovate, 6–7 mm. long; anthers stoutly subulate, 3.5–4 mm. long; ovary glandular-pilose at the summit.

British Honduras to Panama; Cuba; northern South America to Brazil.

BOCAS DEL TORO: Big Bight, *von Wedel 2885*. CANAL ZONE: Old Fort Lorenzo, mouth of Río Chagres, *Piper 5968*. COCLÉ: hills south of El Valle de Antón, *Allen 2509*. PANAMÁ: Cerro Campana, 800 m., *Allen 3988*; San José Island, *Andersson s. n.* PROVINCE UNKNOWN: *Fendler 34*.

9. CLIDEMIA CAPITELLATA (Bonpl.) D. Don, in Mem. Wern. Soc. 4:310. 1823.

Melastoma capitellata Humb. & Bonpl. Melast. *t. 3*. 1816.

Shrub 1–3 m. tall; stems thinly stellate-tomentose and pilose with simple hairs 1–2 mm. long, often more or less glandular distally; petioles 1–2 cm. long; leaf-blades firm, ovate-oblong to ovate-lanceolate, 1–2 dm. long, 4–9 cm. wide, acuminate, minutely serrulate, obtuse to rounded at base, 5- to 7-nerved, hirsute above and below; inflorescence spicate with well defined central axis, up to 15 cm. long, its internodes conspicuously glandular and hirsute; hypanthium 3.5–4 mm. long, short-hirsute and also thinly stellate; sepals broadly quadrate, 1–1.5 mm. long; exterior teeth about 1 mm. longer, conic or stoutly subulate; petals white, obovate-oblong, 4–5 mm. long; anthers stoutly subulate.

Southern Mexico to Panama and Colombia.

CANAL ZONE: Gatún, *Hayes 575*. DARIÉN: Cana and vicinity, *Williams 738, 769*.

10. CLIDEMIA DEPENDENS D. Don, in Mem. Wern. Soc. 4:307. 1823.

Shrub 1–3 dm. tall; stems thinly stellate-tomentose and densely hirsute with non-glandular hairs 2–4 mm. long; petioles densely hirsute, 5–20 mm. long; leaf-blades ovate to ovate-oblong, 7–12 cm. long, 3–7 cm. wide, abruptly short-

acuminate, entire or minutely serrulate, broadly rounded at base, 5-nerved, hirsute above, densely pubescent beneath with both stellate and simple hairs; inflorescence 2–6 cm. long, with a well defined central axis, densely villous with non-glandular hairs 3–6 mm. long, the glomerules nearly or quite contiguous; hypanthium campanulate, about 3 mm. long, densely long-hirsute; sepals depressed-ovate, about 1 mm. long from the sinus, exceeded by the exterior teeth; petals white, oblong-obovate, about 6 mm. long; anthers stoutly subulate; connective simple.

Southern Mexico to Panama and southward to Bolivia and northern Argentina; western Cuba.

CANL ZONE: west slope of Ancón Hill, near Balboa, *Seibert 395*. COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1237*. PROVINCE UNKNOWN: *Seemann 72*.

11. CLIDEMIA REITZIANA Cogn. & Gl. ex Gl. in Brittonia 3:115. 1939.

Shrub about 1 m. tall, the younger stems densely or sparsely hirsute with simple hairs projecting from a dense furfuraceous tomentum; petioles 1–3 cm. long, pubescent like the stem; leaf-blades ovate, 8–17 cm. long, about half as wide, short-acuminate, broadly obtuse to rounded at base, 5-nerved, sparsely hirsute above, beneath densely pilose on the surface and also furfuraceous on the veins; hypanthium densely hirsute and also minutely stellate; calyx spreading, the minute sepals depressed-triangular, the exterior teeth slightly shorter; petals quadrate, about 1.5 mm. long; anthers stoutly subulate, the connective prolonged into an oblong dorsal spur about 0.4 mm. long.

Costa Rica and Panama.

BOCAS DEL TORO: Fish Creek Mountains, *von Wedel 2307*. DARIÉN: Cana-Cuasi trail, *Terry & Terry 1460*.

12. CLIDEMIA DEPPEANA Steud. Nom. Bot. ed. II. 1:384. 1841.

Shrub 1–2 m. tall; stems loosely hirsute with ascending or somewhat appressed hairs. Petioles hirsute, about a third as long as the blade. Leaf-blades ovate-oblong to obovate-oblong, 6–10 cm. long, about half as wide, acute or acuminate, distinctly serrulate, ciliate, obtuse or rounded at base, 3-nerved, densely pilose on both sides, often with purplish hairs; cymes short-peduncled, branched from near the base, 2–4 cm. long, hirsute; hypanthium urceolate to tubular, 3–3.5 mm. long, densely hirsute, some of the hairs occasionally gland-tipped; sepals ovate, obtuse, about 1 mm. long; exterior teeth slenderly subulate, 1.5–2.5 mm. long; petals white, obovate-oblong, about 4 mm. long; anthers stoutly subulate, about 2 mm. long, notched at the apex, the connective minutely prolonged at base.

Southern Mexico to Panama, at low or moderate altitudes.

BOCAS DEL TORO: Isla Colón, *von Wedel 2982*; Water Valley, *von Wedel 604, 947*; vicinity of Almirante, *Cooper 108, 150*.

13. CLIDEMIA COLLINA Gl. in Phytologia 3:359. 1950.

Shrub to 2 m. tall, the stem densely setose with stiff reflexed hairs up to 6 mm.

long; petioles 1–2 cm. long, almost completely occupied by a densely setose formicarium; leaf-blades obovate-oblong, up to 2 dm. long, sparsely setose above, densely hirsute on the veins beneath, almost glabrous on the surface, 7-pli-nerved; flowers 5-merous, in a densely setose cluster; hypanthium campanulate, setose with spreading hairs up to 10 mm. long; sepals oblong, obtuse, nearly 2 mm. long from the torus; exterior teeth slender, sparsely long-setose, surpassing the sepals by 2 mm.; petals white, 5–6 mm. long.

Endemic to Panama, so far as known.

COCLÉ: vicinity of El Valle, 800–1000 m., *Allen 1820*.

14. CLIDEMIA TAURINA Gl. in Phytologia 3:360. 1950.

Shrub to 3 m. tall, the stem densely setose with stiffish reflexed hairs 4–7 mm. long; petioles similarly setose, 1–3 cm. long, the distal half occupied by a didymous long-setose formicarium; leaf-blades oblong-ovate, up to 25 cm. long and three-fifths as wide, 5- to 7-nerved, hirsutulous above, densely hirsute over the whole lower side; inflorescence compact, few-flowered; flowers 5-merous; setae of the hypanthium and exterior teeth rarely more than 3 mm. long; sepals oblong, obtuse, much exceeded by the slender exterior teeth.

Endemic to Panama, so far as known. This and the preceding species are closely related to *C. reflexa* Gl. and *C. spectabilis* Gl. of Costa Rica and to *C. myrmecina* Gl. of Colombia. A re-alignment of species may be necessary when more and better material is available.

BOCAS DEL TORO: Water Valley, *von Wedel 703, 925*; Old Bank Island, *von Wedel 1917*.

15. CLIDEMIA TOCOCOIDEA (DC.) Gl. in Bull. Torr. Bot. Club 58:81. 1931.

Calophysa tococoidea DC. Prodr. 3:166. 1828.
Maieta tococoidea Cogn. in Mart. Fl. Bras. 14^4:465. 1888.

Small shrub, long-hirsute throughout; petioles 1–4 cm. long, bearing formicaria at the base; leaf-blades thin, ovate or ovate-oblong, 1–2 dm. long, 7–12 cm. wide, more or less unequal in each pair, abruptly acuminate, finely serrulate, ciliate, rounded to subcordate at base, 5- to 7-nerved, thinly pilose on both sides; cymes small, compact, few-flowered, sessile or nearly so in the upper axils; hypanthium cylindric, 3–3.5 mm. long, sparsely hirsute; sepals minute; exterior teeth widely spreading, stout, about 1 mm. long; petals 4, white, about 2 mm. long; anthers linear.

British Honduras to Panama and the upper Amazon Valley.

BOCAS DEL TORO: vicinity of Almirante, *Cooper 480*. DARIÉN: Cana-Cuasi Trail, *Terry & Terry 1514*.

16. CLIDEMIA SETOSA (Triana) Gl. in Bull. Torr. Bot. Club 58:82. 1931.

Calophysa setosa Triana, in Journ. Bot. 5:209. 1867.
Maieta setosa (Triana) Cogn. in Mart. Fl. Bras. 14^4:462. 1888.

Low shrub, the stems and petioles densely covered with stiff retrorse setae 7–10

mm. long; petioles 2–5 cm. long, bearing the formicarium at the summit; leaf-blades ovate or ovate-oblong, 1–2 dm. long, about half as wide, short-acuminate, entire or serrulate, ciliate, rounded to subcordate at base, 5- to 7-nerved, long-hirsute above, densely setose near the base beneath; inflorescence long-peduncled, trichotomous, 3–8 cm. long; hypanthium 2–2.5 mm. long, 4-angled, minutely puberulent, usually sparsely setose near the summit; exterior teeth subulate, about 1.5 mm. long; petals 4, about 5 mm. long; anthers linear.

Southern Mexico to Panama.

COCLÉ: El Valle de Antón, near Cerro Turrega, 700 m., *Woodson & Schery 200.*

17. CLIDEMIA EPIPHYTICA (Triana) Cogn. in DC. Monogr. Phan. 7:1025. 1891.

Sagraea epiphytica Triana, in Trans. Linn. Soc. 28:139. 1871.
Prosanerpis panamensis Blake & Standley, in Field Mus. Pub. Bot. 4:245. 1929.

A root-climbing or epiphytic shrub; stems nearly glabrous; petioles of the larger leaves 4–10 cm. long; leaf-blades thin, ovate or ovate-oblong, 12–20 cm. long, about two-thirds as wide, sharply acuminate, conspicuously serrate, cordate at base, 7-nerved, essentially glabrous; smaller leaves 1–5 cm. long; cymes usually 3-flowered, branched at base; hypanthium urceolate, 2–2.5 mm. long, bristly; sepals triangular-ovate about 1 mm. long from the torus; exterior teeth foliaceous, oblong, up to 5 mm. long, long-ciliate.

Panama and at low elevations in northwestern South America.

DARIÉN: Cerro de Garagará, 500–974 m., *Pittier 5611.*

18. CLIDEMIA RUBRA (Aubl.) Mart. Nov. Gen. & Spec. 3:152. *t. 281.* 1829.

Melastoma rubra Aubl. Pl. Guian. 1:416. 1775.

Suffrutescent or woody, up to 2 m. tall, often blooming when young and herbaceous, the stem and foliage densely hirsute or villous throughout; petioles none, or up to 3 cm. long, usually manifest but short; leaf-blades thick, oblong-lanceolate to broadly elliptic, commonly 6–12 cm. long and about half as wide, obtuse to short-acuminate, at base cuneate to subcordate, 5-pli-nerved; flowers few, sessile in dense axillary glomerules, 4-merous; hypanthium cylindric, 3–4 mm. long; exterior teeth triangular below, narrowed to a short, divergent, subulate tip, equaling or slightly exceeding and more or less concealing the sepals; petals obovate-oblong, 2–3 mm. long, white or pinkish; anthers subulate, 3–4 mm. long.

Tropical Mexico to Panama, chiefly at low altitude; very abundant in the lowlands of South America as far south as southern Brazil and Bolivia.

CANAL ZONE: Ancón Hill, *Williams 1, Killip 12101, Piper 5558.* CHIRIQUÍ: Boquete, *Davidson 676, Woodson & Schery 784.* COCLÉ: vicinity of Natá, 50 m., *Allen 843;* vicinity of Penonomé, *Williams 92;* between Olá and Corteza, *Pittier 5097.* PANAMÁ: San José Island, *Johnston 34, Erlanson 382, 428;* Taboga Island, *Macbride 2824.* VERAGUAS: between Cañazas and the Cordillera Central, 300–600 m., *Allen 165.*

19. CLIDEMIA DENSIFLORA (Standley) Gl. in Phytologia 3:346. 1950.

Henriettella densiflora Standley, in Field Mus. Pub. Bot. 4:247. 1929.

Shrub 1–3 m. tall, the younger stems and petioles densely furfuraceous-tomentose; petioles 1–3 mm. long; leaf-blades thin, narrowly elliptic to oblong, 12–20 cm. long, about a third as wide, acuminate, gradually narrowed to the base, 3-nerved, glabrous and shining above, beneath glabrous on the surface, densely furfuraceous on the primary nerves; flowers few, crowded and sessile in small axillary clusters; hypanthium cup-shaped 2–2.5 mm. long; sepals triangular; exterior teeth minute; petals oblong, 2.8 mm. long; connective of the anthers prolonged at base into a minute, glandular, dorsal appendage.

British Honduras and Panama.

BOCAS DEL TORO: Almirante region, *Cooper 575*. DARIÉN: Cana-Cuasi Trail, 600 m., *Terry & Terry 1424*.

20. CLIDEMIA PURPUREO-VIOLACEA Cogn. in Bull. Soc. Bot. Belg. 30[1]:263. 1891; in Dur. & Pitt. Fl. Cost. 166. 1891.

Shrub 1–5 m. tall, the stems, petioles, lower leaf-surface, and hypanthia apparently glabrous, actually very minutely furfuraceous-puberulent; petioles 2–8 cm. long; leaf-blades thin, bright green above, purple beneath, broadly ovate, 12–22 cm. long, 6–13 cm. wide, acuminate, minutely ciliate-denticulate, cordate or subcordate at base, 5- to 7-nerved; inflorescences mostly below the leaves, about 1 cm. long, few-flowered; hypanthium urceolate, 2–2.5 mm. long; sepals depressed-triangular, about 0.5 mm. long; exterior teeth ending in a deflexed seta about 0.5 mm. long; petals oblong, about 2 mm. long; anthers obovate, 2 mm. long.

Costa Rica and Panama.

CANAL ZONE: Chagres, *Fendler 38*. DARIÉN: Cana and vicinity, about 750 m., *Williams 956*; Ensenada Guayabo, *Stern & Chambers 182*. SAN BLAS: San Blas district, *Cooper 235*.

21. CLIDEMIA OMBROPHILA Gl. in Brittonia 3:138. 1939.

Stems slender, essentially glabrous; petioles 8–12 mm. long; leaf-blades firm, shining, elliptic, 6–9 cm. long, 2.5–4 cm. wide, abruptly contracted at the apex into a linear tip 2–3 cm. long, entire, cuneate at base, 3-pli-nerved, essentially glabrous; panicle sessile, trichotomous from the base, its divaricate branches 3–5 cm. long, each bearing 3–5 short-pediceled flowers; hypanthium subglobose, about 2 mm. long, very minutely lepidote; sepals triangular, subacute, 0.9 mm. long; exterior teeth adnate and exactly equaling the sepals.

Known only from the type collection.

DARIÉN: foothills of Garagará, *Pittier 5610*.

23. HENRIETTEA DC.

HENRIETTEA DC. Prodr. 3:178. 1828.

Flowers 5- to 6-merous. Hypanthium campanulate, thick-walled. Calyx-tube distinctly prolonged; sepals small or large, ovate or triangular or nearly obsolete; exterior teeth minute or concealed. Stamens isomorphic; filaments

Fig. 84. *Henriettea succosa*

slender, glabrous; anthers subulate or linear, often beaked; connective neither appendaged nor prolonged. Ovary inferior, 5- to 6-celled; style stout, enlarged toward the summit; stigma punctiform or truncate. Fruit a many-seeded berry. Trees or shrubs with large, usually pli-nerved leaves and medium-sized flowers borne in small axillary clusters below the existing leaves.

About 16 species, mostly in Amazonia but extending through the West Indies and Central America, usually at low altitudes.

1. HENRIETTEA SUCCOSA (Aubl.) DC. Prodr. 3:178. 1828.

Melastoma succosa Aubl. Pl. Guian. 1:418. 1775.

Small tree to 10 m. tall, the younger stems and petioles densely strigose; petioles stout, 5–15 mm. long; leaf-blades firm in texture, narrowly obovate, up to 2 dm. long, a third or nearly half as wide, abruptly acuminate or apiculate, entire, cuneate at base, 3-pli-nerved, scabrously pilose above, beneath strigose on the veins, stellate-pubescent and rather canescent on the surface; flowers few, short-pediceled; hypanthium densely strigose, 8–9 mm. long; sepals ovate, 4–5 mm. long; petals white or pink.

Central America, Trinidad, the Guianas, and eastern Brazil.

BOCAS DEL TORO: Old Bank Island, vicinity of Chiriquí Lagoon, *von Wedel 2113*. CANAL ZONE: Barro Colorado Island, *Shattuck 1093*. PANAMÁ: San José Island, *Johnston 740, Erlanson 340, 502*.

24. BELLUCIA Neck.

BELLUCIA Neck. Elem. Bot. 2:142. 1790.

Flowers 5- to 8-merous. Hypanthium thick-walled, hemispheric. Calyx large, at anthesis divided into 2–8 regular or irregular lobes. Petals large, leathery, oblong or obovate. Stamens isomorphic; filaments short and stout; anthers more or less coherent in a ring, laterally compressed, broadly oblong, elliptic, or dolabriform, opening by two terminal pores; connective neither prolonged nor appendaged. Ovary inferior, 5- to 15-celled; style stout; stigma large, capitate. Fruit a large many-seeded berry. Trees or tall shrubs, with large ovate or oblong leaves and large white or pink flowers on short pedicels solitary or few in the leaf-axils.

About 10 species of low altitudes, most numerous in northern South America. *B. grossularioides* (L). Triana is widely distributed and has been reported from Panama: its calyx exhibits two to five lobes of irregular shape and size at anthesis.

1. BELLUCIA COSTARICENSIS Cogn. in Bull. Soc. Bot. Belg. 30^1:264. 1891. in Dur. & Pitt. Fl. Cost. 167. 1891.

Small tree, glabrous throughout; petioles stout, 2–4 cm. long; leaf-blades firm, broadly elliptic, commonly 1.5–3 dm. long and about two-thirds as wide, obtuse or short-acuminate, entire, obtuse or rounded at base, 5-pli-nerved, the outer pair submarginal; cymes axillary, sessile, trichotomous from the base, 3- to 7-flowered; pedicels about 1 cm. long; hypanthium hemispheric; calyx spreading, nearly 2 cm. wide; petals about 15 mm. long.

Fig. 85. *Bellucia costaricensis*

Costa Rica and Panama.

CANAL ZONE: near Ferry along Thatcher Highway, *White & White 140*; Barro Colorado Island, *Shattuck 1119*. CHIRIQUÍ: vicinity of Remedios, 0–150 m., *Allen 3669*. DARIÉN: Cana and vicinity, 750 m., *Williams 808*. PROVINCE UNKNOWN: *Pittier 5459*.

25. LOREYA DC.

LOREYA DC. 3:178. 1828.

Flowers 5- to 6-merous. Hypanthium cup-shaped to broadly campanulate. Calyx more or less spreading, its lobes shorter than the tube or lacking. Petals obtuse, oblong-obovate or obovate. Stamens isomorphic; filaments short; anthers often coherent in a ring, oblong or ovoid, blunt, opening by a minute terminal pore; connective simple at base, often thickened or elevated along the back of the anther. Ovary wholly inferior, 3- to 6-celled; style elongate; stigma capitate. Trees, often of large size, with broad, usually pli-nerved leaves and small or medium-sized flowers in axillary cymes or fascicles from the leafless nodes.

About 10 species, the others all in lowland forests of Amazonia.

1. LOREYA BRUNNESCENS (Standley) Gl. in Phytologia 3:346. 1950.

Henriettea brunnescens Standley, in Field Mus. Publ. Bot. 4:247. 1929.

Small tree to 8 m. tall, the younger stems, petioles, pedicels, and hypanthia densely brown-hirsute; petioles 3–5 cm. long; leaf-blades rhombic-elliptic, up to 2.5 dm. long, about half as wide, abruptly acuminate, obtuse at base, 5-pli-nerved with an additional pair of marginal nerves, the inner pair arising 3–5 cm. from the base, above glabrous on the surface, strigose on the veins, beneath roughly pubescent; flowers several in axillary clusters, on pedicels about 2 cm. long; hypanthium deeply cup-shaped, about 8 mm. long; sepals triangular, about 2 mm. long; petals and stamens unknown.

Known only from the type collection.

BOCAS DEL TORO: Buena Vista Camp, Chiriquí Trail, 375 m., *Cooper 594*.

26. HENRIETTELLA Naud.

HENRIETTELLA Naud. in Ann. Sci. Nat. Bot. III. 18:107. 1852.

Flowers 4- to 5-merous. Hypanthium small, globose to cup-shaped. Sepals small, triangular or ovate to depressed or obsolete; exterior teeth usually present, conic or subulate, small. Petals ovate to lanceolate or triangular, usually acute or subacute, commonly cucullate at the summit and often exceeded by a minute exterior tooth. Stamens isomorphic; filaments slender, glabrous; anthers oblong, usually obtuse, opening by a large terminal pore; connective simply or briefly prolonged below the thecae, rarely with minute basal lobes. Ovary inferior, 4- to 5-celled; style slender; stigma truncate to capitate. Fruit a many-seeded berry. Shrubs or trees with small cluster of flowers at the leafless nodes or rarely in the axils of the leaves.

Fig. 86. *Henrietella seemanii*

About 40 described species, chiefly in the West Indies and northern South America.

a. Leaves long-tapering at base, strongly pli-nerved..... 1. H. TUBERCULOSA.
aa. Leaves rounded or obtuse at base, 3-nerved or obscurely pli-nerved.
b. Pedicels about 1 mm. long; hypanthium densely pubescent..... 2. H. SEEMANNII.
bb. Pedicels 4–8 mm. long; hypanthium essentially glabrous..... 3. H. FLAVESCENS.

1. HENRIETTELLA TUBERCULOSA Donn. Sm. in Bot. Gaz. 27:335. 1899.

Shrub or tree up to 8 m. tall; younger stems and petioles densely strigose; leaf-blades oblanceolate, up to 15 cm. long and about a third as wide, slenderly acuminate, long-tapering at base, strongly 5-pli-nerved, scabrous above with short stiff hairs from conic bases, densely pubescent beneath; flowers subsessile; hypanthium densely strigose, about 2 mm. long; sepals minute, triangular; petals white, about 2 mm. long, the blade ovate, subacute.

Costa Rica and Panama.

BOCAS DEL TORO: Old Bank Island, Isla Colón, 0–120 m., *von Wedel 1933*.

2. HENRIETTELLA SEEMANNII Naud. in Ann. Sci. Nat. Bot. III. 18:108. 1852.

Small tree, the younger stems and petioles very densely pubescent with ascending hairs 1–1.5 mm. long; petioles 8–15 mm. long; leaf-blades oblong-lanceolate, up to 13 cm. long, about a third as wide, acute, ciliate, rounded at base, 3-nerved, scabrous above, pilose beneath; flowers several in a cluster, 5-merous, on pedicels about 1 mm. long; hypanthium about 3 mm. long, densely pubescent with ascending hairs from swollen bases; sepals depressed-triangular, about 0.4 mm. long; petals lanceolate, nearly 5 mm. long, acuminate, irregular on the margins.

Costa Rica and Panama to northern Colombia.

CANAL ZONE: near Las Cruces, *Seemann s. n.*

3. HENRIETTELLA FASCICULARIS (Sw.) Triana, in Trans. Linn. Soc. 28:143. 1871.

Melastoma fascicularis Sw. Prodr. Veg. Ind. Occ. 71. 1788.

Small tree, up to 10 m. tall, with densely hirsute stems and petioles; petioles stout, 6–12 mm. long; leaf-blades elliptic, oblong, or oblong-obovate, 8–15 cm. long, about half as wide, acute, obtuse or subacute at base, weakly 3-pli-nerved with an additional pair of marginal nerves, scabrously pubescent on the surface and hirsute on the nerves above, densely pubescent beneath; pedicels slender, 3–6 mm. long; hypanthium campanulate, 3 mm. long, essentially glabrous; sepals minute, depressed-ovate; petals white, ovate, acute, about 4 mm. long.

British Honduras, Panama, Guatemala, and the West Indies.

DARIÉN: Cana and vicinity, *Williams 753*.

27. OSSAEA DC.

OSSAEA DC. Prodr. 3:168. 1828.

Flowers 4- to 5-merous. Hypanthium urceolate or subglobose to campanulate

Fig. 87. *Ossaea micrantha*

or nearly tubular. Calyx-tube often conspicuously prolonged; sepals minute or obsolete; exterior teeth varying from minute tubercles to long subulate appendages often simulating a sepal. Petals small, lanceolate to ovate, acute or acuminate, usually with an infra-apical exterior tooth. Stamens isomorphic, erect; filaments slender; anthers linear to oblong; connective simple or very briefly prolonged below the thecae and in a few species continued below the filament into a minute dorsal appendage. Ovary inferior, 3- to 5-celled; style filiform; stigma punctiform or capitellate. Fruit a many-seeded berry, often terminated by the enlarged calyx-tube. Small trees or shrubs with white flowers in fascicles or paniculiform cymes in the axils of existing leaves.

About 90 species, distributed from southern Mexico to Bolivia and southern Brazil but probably most numerous in the West Indies.

a. Flowers in open, repeatedly branched clusters 2–6 cm. long; fruiting hypanthium distinctly ribbed.
  b. Flowers 4-merous; fruit 8-ribbed; leaves acute to obtuse at base..... 1. O. MICRANTHA.
  bb. Flowers 5-merous; fruit obscurely 10-ribbed; leaves typically cuneate at base and more or less decurrent along the petiole..... 2. O. DIVERSIFOLIA.
aa. Flowers subsessile, few, closely crowded in clusters up to 1.5 cm. in diameter; fruiting hypanthium ribless..... 3. O. TRICHOCALYX.

1. Ossaea micrantha (Sw.) Macfadyen, Fl. Jamaic. 2:49. 1850.

Melastoma micrantha Sw. Prodr. Veg. Ind. Occ. 71. 1788.

Shrub or small tree to 10 m. tall; young stems, petioles, and inflorescence nearly or quite glabrous; petioles slender, 1.5–3 cm. long; leaf-blades thin, narrowly oblong-elliptic, 10–17 cm. long, about a third as wide, long-acuminate, entire or nearly so, broadly cuneate to the base but not decurrent, 3-pli-nerved with an additional pair of marginal nerves, the lateral nerves often alternate, essentially glabrous on both sides; panicles loosely branched, 2–5 cm. long; flowers 4-merous; hypanthium subglobose, about 2 mm. long; exterior teeth minute tubercles or lacking; petals narrowly lanceolate, 3–4 mm. long; fruiting hypanthium with 8 rounded elevated longitudinal ribs.

Southern Mexico to Panama and Peru; Jamaica.

BOCAS DEL TORO: Cricamola Valley, region of Almirante, *Cooper 478*; Fish Creek Mountains, *von Wedel 2354*; locality not stated, *von Wedel 192*; Changuinola Valley, *Cooper & Slater 115*. CHIRIQUÍ: Quebrada Velo, 1800 m., *Woodson & Schery 267*; Bajo Chorro, Boquete District, 1800 m., *Davidson 105*.

2. Ossaea diversifolia (Bonpl.) Cogn. in Bull. Acad. Belg. III. 14:968. 1887.

Melastoma diversifolia Humb. & Bonpl. Melast. 138. *t. 59*. 1816.

Shrub to 1.5 m. tall, the younger stems, petioles, and inflorescence densely but finely stellate-furfuraceous; petioles 1.5–5 cm. long; leaf-blades thin, ovate to ovate-lanceolate, 8–20 cm. long, half to two-thirds as wide, abruptly acuminate or apiculate, ciliate, often conspicuously dentate, abruptly narrowed at base and decurrent along the petiole almost to the stem, 5- to 7-pli-nerved, sparsely pilose above, glabrous beneath or furfuraceous on the veins; inflorescence loosely branched, 2–5 cm. long; flowers 5-merous; hypanthium subglobose, about 2 mm. long, in fruit shallowly 5-sulcate and obscurely ribbed; petals lanceolate.

Costa Rica, Panama, and northwestern South America.

BOCAS DEL TORO: Lincoln Creek, *Carleton 87*; region of Almirante, *Cooper 410*. CANAL ZONE: Barro Colorado Island, *Chrysler & Roever 4819, 4870*; Gatún, *Hayes 176*; between Juan Mina and El Vigía, *Pittier 2401*; vicinity of Madden Dam, *Allen 2009*; Ahorca Lagarto, *Cowell 250*. CHIRIQUÍ: vicinity of Puerto Armuelles, *Woodson & Schery 855*. DARIÉN: headwaters of Río Chico, 150–225 m., *Allen 4612*; Río Sabana, *Leopold III 189*. PROVINCE UNKNOWN: *Kuntze 194*.

3. Ossaea trichocalyx Pittier, in Journ. Wash. Acad. Sci. 13:391. 1923.

Shrub or small tree to 6 m. tall, the younger stamens and petioles very finely furfuraceous; petioles 1–5 cm. long; leaf-blades thin, ovate-lanceolate to oblong, 10–22 cm. long, 4–10 cm. wide, long-acuminate, entire, abruptly narrowed below to a long cuneate base, glabrous above, essentially glabrous beneath, 5- to 7-pli-nerved, the inner pair arising 2–5 cm. from the base; flowers 4-merous, subsessile or very short-pediceled, densely crowded in clusters 10–15 mm. wide at leafless nodes; hypanthium urceolate, 2.5 mm. long, essentially glabrous; exterior teeth subulate, spreading, about 1.5 mm. long, glandular-setose; petals 1.6 mm. long.

British Honduras to Ecuador, chiefly at low altitudes.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 2197A, 2911*; Water Valley, *von Wedel 1462*. DARIÉN: Cana-Cuasi Trail, 900 m., *Terry & Terry 1450*; above Paca, *Williams 742*.

28. LEANDRA Raddi

LEANDRA Raddi, in Mem. Mod. 18 Fis.: 385. 1820.

Flowers 4- to 8-merous. Hypanthium globose to tubular, often constricted at the mouth. Sepals small or obsolete; exterior teeth present, minute to elongate. Petals ovate to narrowly lanceolate, rarely obovate, acute to acuminate, the covered side often much the wider, usually erect at anthesis. Stamens nearly or quite isomorphic; filaments slender, smooth; anthers linear to oblong or rarely subulate, 2-celled or 4-celled; connective simple or rarely slightly prolonged at base, never appendaged, often gibbous on the back near the base. Ovary mostly or wholly inferior, its cells often isomerous with the petals; style slender; stigma capitellate to punctiform. Fruit a many-seeded berry. Shrubs or small trees, almost always pubescent, often hirsute or hispid, with terminal panicles or bracteate heads of small, usually white flowers.

More than 200 species, extending from Mexico to Bolivia and southern Brazil, avoiding the West Indies.

a. Pubescence of younger parts of the stem and axis of the inflorescence of short, spreading, simple hairs surpassed by projecting, stouter, glandular hairs; leaves 7-nerved..... 1. L. MEXICANA.

aa. Pubescence of the stem never glandular.

b. Indument of the younger parts of the stem and the axis of the inflorescence a dense mass of strongly barbellate hairs, commonly with projecting simple bristles; leaves all or mostly 5-nerved.

c. Leaves sparsely hirsute on the surface beneath with straight or curved simple bristles (commonly more or less stellate on the principal veins)..... 2. L. MELANODESMA.

cc. Leaves stellate-pubescent on the surface beneath..... 3. L. SUBSERIATA.

bb. Indument of the stem and axis of the inflorescence composed entirely of simple bristles.

c. Hairs of the stem more or less retrorse, at least at their bases..... 4. L. DICHOTOMA.

cc. Hairs of the stem antrorse, distinctly appressed or ascending.

d. Flowers 5-merous; exterior teeth none or very short and inconspicuous..... 5. L. STRIGOSA.

dd. Flowers 4-merous; exterior teeth subulate, 5–6 mm. long..... 6. L. SUBULATA.

bbb. Indument of the younger parts of the stem and the axis of the inflorescence merely brown-pulverulent; leaves strongly 5-pli-nerved. 7. L. CONSIMILIS.

1. LEANDRA MEXICANA (Naud.) Cogn. in Mart. Fl. Bras. 14^4:77. 1886.

Clidemiastrum mexicanum Naud. in Ann. Sci. Nat. Bot. III. 17:87. 1852.

Shrub 1–3 m. tall, the stems pubescent with slender simple hairs slightly surpassed by glandular ones; petioles 2–6 cm. long, similarly pubescent; leaf-blades thin, ovate, 1–2 dm. long, 4–15 cm. wide, acuminate, serrulate, broadly rounded to subcordate at base, 7-nerved, hirsutulous above and also sparsely pilose with longer stiff hairs; panicle 6–10 cm. long, its branches eventually greatly elongate, divaricate, and more or less flexuous; flowers commonly 7-merous; hypanthium broadly tubular, 3–3.5 mm. long, densely villosulous with simple hairs and sparsely

glandular-hirsutulous, the hairs up to 0.5 mm. long; petals about 3 mm. long; sepals depressed-ovate, 1–1.5 mm. long.

Southern Mexico to Panama, usually at low altitudes.

BOCAS DEL TORO: Water Valley, *von Wedel 1903, 1913*; Little Bocas, *von Wedel 2493*; Big Bight, *von Wedel 2890*. CHIRIQUÍ: San Félix, *Pittier 5201*. CANAL ZONE: Colón, *Kuntze*; Monkey Hill, *Cowell 43*. PANAMÁ: San José Island, *Johnston 461*.

2. LEANDRA MELANODESMA (Naud.) Cogn. in Mart. Fl. Bras. 14[4]:115. 1886.

Clidemia melanodesma Naud. in Ann. Sci. Nat. Bot. III. 17:353. 1852.

Shrub or small tree up to 5 m. tall; younger stems, petioles, and inflorescence densely covered with a mass of strongly barbellate or plumose hairs surpassed by projecting simple bristles; petioles slender, up to 4 cm. long; leaf-blades ovate-lanceolate or oblong-ovate, 8–15 cm. long, 2–7 cm. wide, acuminate, entire, obtuse to rounded at base, 5-nerved, very sparsely and minutely hispidulous above, sparsely hirsute beneath with simple bristles, the barbellate pubescence of the petiole continuing along the primary nerves and to some extent along the secondaries; panicle slender with ascending branches, 5–15 cm. long; flowers 5-merous; hypanthium subglobose, minutely stellate and hirsutulous; sepals depressed-triangular, very short, the exterior teeth minute; petals white, about 3 mm. long.

In mountainous regions, southern Mexico to Colombia.

CHIRIQUÍ: Finca Lérida to Peña Blanca, *Woodson & Schery 309*; vicinity of Finca Lérida, 1750 m., *Woodson & Schery 213*; vicinity of Casita Alta, 1500–2000 m., *Woodson, Allen, & Seibert 800*; Sierra del Boquete, *Maurice 719*; vicinity of Cerro Punta, 1500–2000 m., *Seibert 253, White 32*; valley of the upper Río Chiriquí Viejo, *White 23*; Boquete, *Davidson 857*; Volcán de Chiriquí, *Davidson 919*.

3. LEANDRA SUBSERIATA (Naud.) Cogn. in Mart. Fl. Bras. 14[4]:73. 1886.

Clidemia subseriata Naud. in Ann. Sci. Nat. Bot. III. 17:354. 1852.

Very like *L. melanodesma* in all features except the pubescence; lower surface of the leaves sparsely pubescent with short-stipitate stellate hairs; hypanthium often stellate only without simple bristles.

Southern Mexico to Panama; also in Venezuela, Colombia, and Ecuador.

CHIRIQUÍ: vicinity of New Switzerland, 1800–2000 m., *Allen 1343*.

4. LEANDRA DICHOTOMA (D. Don) Cogn. in Mart. Fl. Bras. 14[4]:200. 1886.

Clidemia dichotoma D. Don, in Mem. Wern. Soc. 4:307. 1823.

Shrub 1–3 m. tall; younger stems, petioles, and axis of the inflorescence densely hirsute with straight or curved, distinctly retrorse or retrorsely outwardly curved, simple bristles; petioles 2–5 cm. long; leaf-blades ovate-lanceolate to ovate-oblong or oblong, 1–2 dm. long, 5–12 cm. wide, acuminate, denticulate and strongly ciliate, broadly obtuse to rounded at base, commonly 7-nerved, more or less hirsute on both sides, especially on the nerves beneath; panicles 1–2 dm. long, the branches becoming widely divaricate and crooked, with secund 5-merous flowers; hypanthium subglobose, densely hirsute; sepals minute, depressed-triangular, the exterior teeth subulate, about 1 mm. long; petals white, 2.5–3 mm. long.

Fig. 88. *Leandra melanodesma*

Guatemala and British Honduras to Panama and Bolivia.

BOCAS DEL TORO: Water Valley, *von Wedel 1419*; Old Bank Island, *von Wedel 1971*; vicinity of Chiriquí Lagoon, *von Wedel 1075*; Fish Creek Mountains, *von Wedel 2370*; Cricamola, Almirante region, *Cooper 514*. CANAL ZONE: Barro Colorado Island, *Aviles 913, Bailey & Bailey 470*.

5. LEANDRA STRIGOSA Gl. in Phytologia 3:345. 1950.

Shrub up to 2 m. tall; younger stems, petioles, and axis of the inflorescence densely strigose with appressed or closely ascending hairs 0.5–1.5 mm. long; petioles 1–3 cm. long; leaf-blades ovate-lanceolate or ovate, up to 15 cm. long and 10 cm. wide, acuminate, denticulate, densely ciliate, rounded at base, 5-nerved, densely pubescent on both sides; panicle 6–20 cm. long; flowers 5-merous, sessile, secund; hypanthium cup-shaped, densely strigose, some of the hairs gland-tipped; sepals triangular, about 0.5 mm. long; exterior teeth none; petals white, about 2.3 mm. long.

Panama and Colombia.

CHIRIQUÍ: between Río Tinta and Río Tabasará, *Allen & Seibert 415*. COLÓN: vicinity of Camp Pina, 25 m., *Allen 3672*.

6. LEANDRA SUBULATA Gl. in Phytologia 3:345. 1950.

Epiphytic shrub up to 2 m. tall; stem, petioles, inflorescence, and hypanthia densely covered with straight, appressed, spinulose hairs 1–2 mm. long; leaves long-petioled, the blades ovate, 2–3.5 cm. long, about half as wide, acute, spinulose-ciliate, rounded at base, obscurely 5-nerved or weakly 7-pli-nerved, strigillose on both sides; flowers 4-merous, in terminal cymules; hypanthium obconic; sepals very short, acute, triangular, the exterior teeth subulate, erect, 5–6 mm. long; petals ovate, pink, 4 mm. long.

Known only from the type specimen.

BOCAS DEL TORO: northern slopes of Cerro Horqueta, 1800–2100 m., *Allen 4804*.

7. LEANDRA **consimilis** Gleason, spec. nov.

Arbuscula, caulibus 4-sulcatis, petiolis, et ramis inflorescentiae minute pulverulento; folia petiolata, anguste elliptica, utrinque acuminata, valde 5-plinervia, supra glabra, subtus ad venas pulverulenta caeterum glabra.

Small tree 5 m. tall, the younger parts of the 4-sulcate stems, petioles, and branches of the inflorescence minutely brown-pulverulent; petioles about 1 cm. long; leaf-blades thin, narrowly elliptic, up to 2 dm. long, about a third as wide, equally and gradually tapering to both ends, strongly 5-pli-nerved, pulverulent on the veins beneath, otherwise glabrous; panicle widely branched, about 1 dm. long; flowers 5-merous; hypanthium 1.4 mm. long, nearly glabrous; calyx about 0.8 mm. long, the acute triangular lobes about equaling the tube, barely exceeded by the minute, subulate, exterior teeth; petals oblong-lanceolate, about 3.5 mm. long; anthers short, oblong; style about 4 mm. long; stigma rounded, not dilated.

Known only from the type specimen.

PANAMÁ: Las Minas, *Allen 2702*. (Herb. New York Bot. Gard., HOLOTYPE).

The plant exhibits a striking superficial similarity in leaves, pubescence, and inflorescence to *Conostegia micromeris* Standl.

29. CONOSTEGIA D. Don.

CONOSTEGIA D. Don, in Mem. Wern. Soc. 4:316. 1823.

Flowers 5- to 10-merous. Calyx calyptrate, deciduous at or near the torus in anthesis, the flower-buds globose to pyriform or obovoid. Petals white or pink, often very inequilateral or conspicuously retuse. Stamens isomorphic, two to five times as many as the petals; filaments slender, glabrous; anthers linear or oblong, 4-celled, more or less laterally compressed, opening by a terminal or ventro-terminal pore; connective neither appendaged nor prolonged; thecae often prolonged a short distance below the apex of the filament. Ovary wholly inferior, 5- to 12-celled; style straight or bent; stigma punctiform, truncate, capitate, or broadly peltate and retuse. Fruit a many-seeded berry. Trees or shrubs, with usually pli-nerved leaves and terminal panicles of small or medium-sized white or pink flowers.

More than 50 species have been described, ranging from southern Mexico and the West Indies to Ecuador and Brazil but most numerous in Central America. The key which follows is largely artificial, since a reasonable classification of the species has not yet been achieved.

a. Buds globose, apiculate or not, uniformly thick-walled, with no distinction between the hypanthial and calycine portions; stigma (so far as known) broad, retuse, radially lobed.
  b. Hypanthium about 7 mm. long (measured on the axis), commonly verrucose; leaves very weakly pli-nerved; anthers elliptic, about half as wide as long ..... 1. C. MACRANTHA.
  bb. Hypanthium about 4 mm. long, smooth; leaves strongly pli-nerved; anthers about a third as wide as long ..... 2. C. OERSTEDIANA.
aa. Buds pyriform to obovoid, rarely obtuse, commonly acute, acuminate, or apiculate, with obvious superficial distinction between the hypanthial and calycine portions; stigma neither lobed nor retuse.
  b. Pubescence of the lower leaf-surface entirely or chiefly of slender simple setae.
    c. Leaves pli-nerved, bearing petiolar formicaria; buds about 5–6 mm. long.
      d. Petioles 1.5–5 cm. long; leaf-blades basally rounded ..... 3. C. HIRSUTA.
      dd. Petioles at most 1 cm. long; leaf-blades basally attenuate ..... 4. C. SETOSA.
    cc. Leaves 3-nerved; formicaria none; buds about 8 mm. long ..... 5. C. BRACTEATA.
  bb. Pubescence of lower leaf-surface, petioles, stems, and hypanthia of long-stipitate stellate hairs ..... 6. C. SPECIOSA.
  bbb. Pubescence of lower leaf-surface of sessile stellate hairs, often minute or scanty, or wholly lacking at maturity.
    c. Lower leaf-surface completely concealed by a fine, close, canescent tomentum ..... 7. C. XALAPENSIS.
    cc. Lower leaf-surface not concealed by the indument.
      d. Style narrowed distally to a truncate or punctiform stigma.
        e. Leaves 3-nerved, short-apiculate at the obtuse or rounded summit; buds about 10 mm. long, acuminate ..... 8. C. POLYANDRA.
        ee. Leaves 5-pli-nerved, acuminate; buds obtuse, 3.5 mm. long ..... 9. C. MICROMERIS.
      dd. Style of uniform diameter or widened distally; stigma capitate to peltate.
        e. Leaves of an oblanceolate type, broadest well above the middle. 10. C. PUBERULA.
        ee. Leaves of an ovate or oblong type, broadest near or below the middle.

f. Leaves hirsutulous above, conspicuously dentate and ciliate. 11. C. SUBCRUSTULATA.
ff. Leaves glabrous above, entire or nearly so, never ciliate.
g. Buds acuminate or rostrate, 7–13 mm. long.
h. Petals 4–6 mm. long; buds 7–8 mm. long; leaves stellate-tomentulose on the veins beneath..... 12. C. MONTANA.
hh. Petals 10–15 mm. long; buds 10–13 mm. long; leaves glabrous beneath..... 13. C. CHIRIQUENSIS.
gg. Buds rounded at the summit, 3.5–4 mm. long..... 14. C. MICRANTHA.

1. CONOSTEGIA MACRANTHA Berg, ex Triana, in Trans. Linn. Soc. 28:97. 1871.

Tree to 10 m. tall, usually more or less furfuraceous, especially about the inflorescence; petioles 2–4 cm. long; leaf-blades elliptic, 10–15 cm. long, half to two-thirds as wide, obtuse or apiculate, at base obtuse or rounded, 5-nerved or barely 5-pli-nerved, glabrous on both sides or minutely stellate beneath; panicle widely branched, few-flowered; buds globose, 10–15 mm. long; hypanthium at anthesis about 7 mm. long, usually verrucose; flowers white, usually 7-merous; anthers oval, about half as wide as long.

Costa Rica and Panama.

CHIRIQUÍ: Río Chiriquí Viejo Valley, near El Volcán, *White & White 194*.

2. CONOSTEGIA OERSTEDIANA Berg, ex Triana, in Trans. Linn. Soc. 28:98. 1871.

Tree to 15 m. tall, glabrous throughout; petioles 1–3 cm. long; leaf-blades varying oblong-ovate to oblanceolate or obovate, 6–15 cm. long, usually less than half as wide, apiculate or acuminate, at base cuneate, acute, or rarely obtuse, 3- to 5-pli-nerved; panicle small, widely branched; buds globose, 7–10 mm. long, usually apiculate; hypanthium at anthesis about 4 mm. long; flowers white, commonly 7-merous; anthers elliptic, about a third as wide as long.

Costa Rica and Panama.

CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, *White & White 98*.

3. CONOSTEGIA **hirsuta** Gl. nom. nov.

Cryptophysa setosa Standley & Macbride, in Field Mus. Pub. Bot. 4:244. 1929. Not *Conostegia setosa* Triana 1871.

Shrub, the stem, leaves, panicle, and hypanthium setose with simple bristles; petioles up to 5 cm. long, the upper half and a portion of the midnerve occupied by a slender formicarium; leaf-blades obovate-oblong, up to 2 dm. long and half as wide, abruptly acuminate, shallowly undulate-dentate, obtuse or rounded at base; panicle small, many-flowered; buds 4–4.5 mm. long, the pyriform body tipped by a slender beak; petals white, about 5 mm. long; style straight; stigma capitate.

Endemic to Panama, so far as known.

BOCAS DEL TORO: Buena Vista, *Cooper 219*.

4. CONOSTEGIA SETOSA Triana, in Trans. Linn. Soc. 28:99. 1871.

Shrub, similar to *C. hirsuta* but the petioles only 0.5–1 cm. long, the formicaria short and broad, the leaf-blades attenuate basally, the buds 5–6 mm. long.

Eastern Panama to northwestern Colombia.

DARIÉN: Ensenada Guayabo, *Stern & Chambers 178.*

5. CONOSTEGIA BRACTEATA Triana, in Journ. Bot. 4:209. 1867.

Shrub to 3 m. tall, the younger stems hirsute; petioles 5–12 mm. long; leaf-blades narrowly elliptic to oblanceolate, 8–15 cm. long, a fourth to a third as wide, acuminate, obscurely serrulate, hirsutulous on both sides, 3-nerved; panicle small, the glomerulate flowers subtended by oblong-obovate bracts 8 mm. long and by smaller bractlets; buds pyriform, about 8 mm. long, abruptly acuminate, hirsute; hypanthium at anthesis about 3 mm. long; petals white, 7–8 mm. long; style straight; stigma ovoid, scarcely wider than the style.

Nicaragua to Panama. The species exists in two forms: plants of the lowlands have leaves distinctly acuminate to a narrow base; plants of the highlands have leaves convexly narrowed to an obtuse base.

CANAL ZONE: between Frijoles and Monte Lirio, 30 m., *Killip 12158*; Barro Colorado Island, *Aviles 876.* COLÓN: Río Lagarto region, Gatún Lake, *Seibert 1530.* DARIÉN: Cana-Cuasi trail, Chepigana district, 600 m., *Terry & Terry 1462.* PROVINCE UNKNOWN: *Pittier 5619.*

6. CONOSTEGIA SPECIOSA Naud. in Ann. Sci. Nat. Bot. III. 16:109. 1851.

Shrub to 7 m. tall, the stems, petioles, lower leaf-surface, panicles, and hypanthia softly pubescent with stellate hairs on stipes 1–2 mm. long; petioles stout, 1–2 cm. long; leaf-blades ovate, oblong-ovate, or oblong-obovate, up to 25 cm. long, half to two thirds as wide, acuminate, usually serrate, obtuse or rounded at base, 5- to 7-pli-nerved, hirsute above with simple bristles; panicle many-flowered, divaricately branched, up to 15 cm. long; buds pyriform, subacute, about 7 mm. long; hypanthium at anthesis 3–4 mm. long; petals pink, 5–7 mm. long; style 3–4 mm. long, abruptly bent near the summit beneath the expanded flat stigma.

BOCAS DEL TORO: Bastimentos, Mariano Creek, *von Wedel 2904.* CANAL ZONE: Ancón Hill, *Killip 3011, Williams 16, Woodson, Allen & Seibert 1332*; Barro Colorado Island, *Aviles 892, Bailey & Bailey 6, 232, Bangham 391, 412, Brown 134, Fairchild, Shattuck 707, Starry 123, Wetmore & Abbe 9, Wheeler 83, Woodson & Seibert 972, Woodworth & Vestal 341*; vicinity of Gamboa, *Allen 197*; Gatún, *Hayes 239*; Madden Dam, *Seibert 551*; vicinity of Miraflores, *White 137*; Corundu, *Harvey 5186*; east of Fort Clayton, *Harvey 5109*; between Mt. Hope and Santa Rita trail, *Cowell 86, 87*; Las Sabanas, *Pittier 6709*; Santa Rita trail, *Cowell 152.* COCLÉ: Llano Bonito, north of Las Margaritas, 400–500 m., *Seibert 532*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1742.* DARIÉN: *Macbride 2710.* PANAMÁ: forests near Arraiján, *Woodson, Allen & Seibert 1361*; Isla Taboga, 0–186 m., *Woodson, Allen & Seibert 1524*; vicinity of Pacora, 35 m., *Allen 1118*; San José Island, *Johnston 446, 1166, Erlanson 567, Harlow 69.* PROVINCE UNKNOWN: *Duchassaing s. n., Halsted s. n., Hayes 833.*

7. CONOSTEGIA XALAPENSIS (Bonpl.) D. Don, in Mem. Wern. Soc. 4:317. 1823.

Melastoma xalapense Humb. & Bonpl. Melast. 126. *t. 54.* 1816.
Conostegia lanceolata Cogn. in DC. Monogr. Phan. 7:708. 1891.

Shrub or small tree to 10 m. tall, the younger stems thinly but closely tomentulose; petioles 1–1.5 cm. long; leaf-blades variable in shape, commonly narrowly lanceolate, up to 15 cm. long and 4 cm. wide, occasionally oblanceolate or ovate-

Fig. 89. *Conostegia speciosa*

lanceolate, acuminate, commonly dentate at least beyond the middle, obtuse to cuneate at base, glabrous above when mature, permanently canescent beneath with a fine close tomentum, 3- to 5-pli-nerved; panicle up to 1 dm. long; buds pyriform, acute, 5–6 mm. long, tomentose; petals pink or white, 5–8 mm. long; style 4–5 mm. long, abruptly bent and slightly dilated below the capitate stigma.

Abundant and widely distributed from southern Mexico into northern South America. Narrow-leaved plants, distinguished by Cogniaux as *C. lanceolata*, are the most abundant in Panama.

BOCAS DEL TORO: southwest of Bocas at Macaw Hills, *von Wedel 530*; without locality, *von Wedel 334*; Changuinola Valley, *Dunlap 143*. CANAL ZONE: Barro Colorado Island, *Aviles 99, Shattuck 857, 1062*; Chagres, *Fendler 30*; Gatún, *Hayes 252*; between Mt. Hope and Santa Rita trail, *Cowell 93*. CHIRIQUÍ: Bajo Mono, Boquete district, 1350 m., *Davidson 517*; vicinity of El Boquete, 1000–1300 m., *Maxon 4930*; Finca Lérida to Boquete, 1300–1700 m., *Woodson, Allen & Seibert 1122*; Río Chiriquí Viejo Valley, near El Volcán, *White 210*. COCLÉ: vicinity of El Valle de Antón, *Allen 1771, 2502, 3546, Maurice 778, Seibert 494*. COLÓN: along Río Fató, 10–100 m., *Pittier 3883*. PANAMÁ: hills above Campana, 600–800 m., *Allen 1693*.

8. CONOSTEGIA POLYANDRA Benth. Bot. Voy. Sulphur 96. *t. 35*. 1844.

Shrub or small tree to 6 m. tall, the younger parts minutely stellate-puberulent, soon glabrescent; petioles slender, 1–2.5 cm. long; leaf-blades elliptic or oblong, 5–9 cm. long, about half as wide, obtuse or short-apiculate, entire, obtuse to rounded at base, 3-nerved, essentially glabrous at maturity; panicle widely branched, 5–10 cm. long; buds pyriform, acuminate, glabrous, about 10 mm. long; hypanthium about 4 mm. long at anthesis; petals white, about 10 mm. long; style straight, 8–10 mm. long, tapering distally to a punctiform stigma.

Costa Rica, Panama, and Colombia.

BOCAS DEL TORO: Old Bank Island, *von Wedel 1876, 1920*; Bastimentos, Mariano Creek, *von Wedel 2895*; Isla de Colón, *von Wedel 75, 102, 531*; Fish Creek Hills, *von Wedel 2416*; Nances Cay, *von Wedel 2935*; without locality, *von Wedel 341*.

9. CONOSTEGIA MICROMERIS Standley, in Contr. Arn. Arb. 5:117. *pl. 15*. 1933.

"Tall tree," the younger parts minutely furfuraceous, soon glabrescent; petioles 2–5 mm. long; leaf-blades thin, oblanceolate, up to 22 cm. long, about a third as wide, acuminate, entire, long-cuneate to the base, 5-pli-nerved, glabrous above at maturity, minutely furfuraceous on the veins beneath; panicle 3–6 cm. long, divaricately branched; buds 3–3.5 mm. long, minutely furfuraceous; hypanthium 2–2.5 mm. long at anthesis; petals white, 3–3.5 mm. long; style about 5 mm. long, narrowed above to a small truncate or punctiform stigma.

Panama and western Colombia.

CANAL ZONE: Barro Colorado Island, *Killip 39988, Woodworth & Vestal 602*.

10. CONOSTEGIA PUBERULA Cogn. in DC. Monogr. Phan. 7:703. 1891.

Conostegia sororia Standley, in Field Mus. Pub. Bot. 22:161. 1940.

Tree to 12 m. tall, the younger parts finely but completely brown-stellate-

tomentulose; petioles slender, 2–3 cm. long, tomentulose; leaf-blades oblanceolate, up to 2 dm. long, a third to two-fifths as wide, caudate-apiculate or abruptly short-acuminate, entire, gradually narrowed to an acute or cuneate base, glabrous above, thinly stellate beneath and along the veins and veinlets; panicle 1–1.5 dm. long; buds pyriform, obtuse or subacute, never apiculate, about 8 mm. long, completely and permanently brown-stellate-tomentulose; hypanthium at anthesis about 4 mm. long; petals white, 6–8 mm. long; style stout, columnar, 4–5 mm. long; stigma hemispheric-capitate.

Costa Rica and Panama.

BOCAS DEL TORO: Almirante region, *Cooper 412, 487, 581*; Cricamola Valley, *Cooper 486*; Changuinola Valley, *Cooper & Slater 91, Dunlap 412, 508*. COLÓN: around Dos Bocas, Río Fató Valley, 40–80 m., *Pittier 4218*. DARIÉN: Chepigana district, 240 m., *Terry & Terry 1414*.

11. CONOSTEGIA SUBCRUSTULATA (Beurl.) Triana, in Trans. Linn. Soc. 28:98. 1871.

Miconia subcrustulata Beurl. Prim. Fl. Portob. 130. 1854.

Shrub or small tree, up to 8 m. tall, the younger parts of the stem, petioles, panicle, and lower leaf-surface floccose-tomentulose with stellate hairs; petioles 1–4 cm. long; leaf-blades usually ovate, varying to ovate-oblong, up to 2 dm. long, half to two-thirds as wide, acute or short-acuminate, conspicuously serrate and ciliate, rounded to subcordate at base, 7- to 9-pli-nerved, sparsely hirsutulous above with simple hairs; panicle many-flowered, 1–2 dm. long; buds pyriform, 4–5 mm. long, acuminate and often falcate, the hypanthial portion stellate-tomentulose, the calycine portion nearly glabrous; hypanthium 2.5 mm. long at anthesis; petals pink, 4–5 mm. long; style about 4 mm. long, abruptly dilated and bent just below the capitate stigma.

Nicaragua to Colombia.

BOCAS DEL TORO: Almirante region, *Cooper 341*; Fish Creek lowlands, *von Wedel 2386*; Little Bocas, *von Wedel 2548*; vicinity of Nievecita, *Woodson, Allen & Seibert 1874*; Old Bank Island, *von Wedel 2178*; banks of the Changuinola River, *Dunlap 297*; without locality, *Carleton 172*. CHIRIQUÍ: Cerro Galera Chorcha, vicinity of Gualaca, 300 m., *Allen 5064*; vicinity of San Félix, 100 m., *Allen 3653*; Río Chiriquí to Remedios, 15–50 m., *Woodson, Allen & Seibert 1183*. COCLÉ: vicinity of El Valle de Antón, 500–1000 m., *Allen 1152, Seibert 484*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1740*; Bismarck, above Penonomé, *Williams 288, 575*. DARIÉN: headwaters of the Río Chico, 150–225 m., *Allen 4502*. VERAGUAS: hills west of Soná, 500 m., *Allen 1031*.

12. CONOSTEGIA MONTANA (Sw.) D. Don, in Mem. Wern. Soc. 4:317. 1823.

Melastoma montana Sw. Prodr. Veg. Ind. Occ. 69. 1788.

Small tree to 10 m. tall, the younger parts of the stem, petioles, and veins of the lower leaf-surface thinly but distinctly stellate-tomentulose; petioles slender, 2–4 cm. long; leaf-blades thin, up to 15 cm. long, about a third as wide, acuminate, entire, obtuse at the base, glabrous above, 5-pli-nerved; panicle 10–15 cm. long, widely branched, many-flowered; buds pyriform, 7–8 mm. long, acute or short-apiculate, glabrous; hypanthium at anthesis 2.5–3 mm. long; petals white, 4–6 mm.

long; style 4–5 mm. long; stigma capitate, 1–1.3 mm. in diameter.

Costa Rica, Panama, and the West Indies.

BOCAS DEL TORO: Robalo trail, northern slopes of Cerro Horqueta, 1800–2100 M., *Allen 4942, 5006*. CHIRIQUÍ: Quebrada Velo, vicinity of Finca Lérida, 1500 m., *Allen 4684*; between Alto de las Palmas and top of Cerro de la Horqueta, 2100–2268 m., *Pittier 3281*.

13. CONOSTEGIA CHIRIQUENSIS Gl. ex Woods. & Schery, in Ann. Mo. Bot. Gard. 28:436. 1941.

Tree to 20 m. tall, glabrous except the very youngest stems and unfolding leaves; petioles slender, 1–3 cm. long; leaf-blades firm, elliptic or obovate-oblong, up to 15 cm. long, a third to half as wide, apiculate or abruptly short-acuminate, entire, obtuse at the base, 5-pli-nerved; panicle 5–15 cm. long, few-flowered, the branches ascending; buds pyriform, apiculate, 10–13 mm. long; hypanthium at anthesis 3–4 mm. long; petals white, more or less unguiculate, 10–15 mm. long; style stout, 4–5 mm. long; stigma hemispheric, capitate, about 1.5 mm. in diameter.

Endemic to Panama, so far as known.

CHIRIQUÍ: Río Chiriquí Viejo valley, *White 47, 324*; trail from Paso Ancho to Monte Lirio, valley of Río Chiriquí Viejo, 1500–2000 m., *Allen 1480*; vicinity of Callejón Seco, Volcán de Chiriquí, 1700 m., *Woodson & Schery 479*; forests around El Boquete, 1000–1300 m., *Pittier 3142*.

14. CONOSTEGIA MICRANTHA Standley, in Trop. Woods 16:18. 1928. Nomen; Field Mus. Pub. Bot. 4:246. 1929.

Tree to 10 m. tall, the younger parts of the stem, petioles, and panicle loosely stellate-pubescent; petioles 2.5–3.5 cm. long; leaf-blades elliptic, varying to somewhat ovate or obovate, up to 18 cm. long, about half as wide, abruptly caudate-acuminate, entire or undulate, broadly obtuse at base, barely to distinctly 5-pli-nerved, glabrous above, stellate-pubescent beneath; panicle pyramidal, many-flowered, 3–12 cm. long; buds obovoid, 3.5–4 mm. long, rounded at the summit, truncate or retuse at the base, glabrous or nearly so; hypanthium 2 mm. long at anthesis; petals white, about 4 mm. long; style columnar, 3–4 mm. long; stigma capitate.

Costa Rica and Panama.

BOCAS DEL TORO: Buena Vista Camp on the Chiriquí trail, 375–540 m., *Cooper 578, 619*.

30. TOCOCA Aubl.

TOCOCA Aubl. Pl. Guian. 1:437. *t. 174*. 1775.

Flowers usually 5-merous. Hypanthium obconic to campanulate. Calyx-tube more or less prolonged, erect to flaring; sepals usually short or obsolete; exterior teeth often conspicuous. Petals obovate to oblong, inequilateral, usually retuse. Stamens isomorphic or nearly so; filaments stout; anthers erect, linear or subulate, always more or less incurved at the summit; connective elevated into a low ridge

Fig. 90. *Tococa guyanensis*

along the thecae and often gibbous near their base, below the thecae neither prolonged nor appendaged. Ovary half-inferior, 3- to 5-celled; style stout, glabrous or pubescent; stigma capitate, often large. Fruit a many-seeded berry. Shrubs or even small trees with broad leaves often unequal in each pair and in many species bearing formicaria at the summit of the petiole or base of the blade; flowers medium-sized, white to pink, in terminal panicles.

About 60 species, most numerous in Amazonia.

1. Tococa guyanensis Aubl. Pl. Guian. 1:438. *t. 174.* 1775.

Shrub 1–3 m. tall, the younger stems strongly flattened, glabrous to setose; petioles stout, 1–6 cm. long, pubescent on the back, many of them bearing an inflated formicarium at the summit; leaf-blades ovate-lanceolate to oblong or elliptic, 10–25 cm. long, half to two-thirds as wide, usually ciliate, 5-nerved, sparsely setose above, thinly pubescent beneath; panicle 1–2 dm. long; flowers sessile; hypanthium about 5 mm. long; calyx almost truncate, with broadly triangular glandular-setose exterior teeth; petals about 8 mm. long.

British Honduras and Panama; widely distributed in South America from Columbia to the Guianas and Bolivia.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 1139.* COCLÉ: Bismarck, above Penonomé, *Williams 586*; locality not stated, *Cooper & Slater 151.*

31. HETEROTRICHUM DC.

Heterotrichum DC. Prodr. 3:173. 1828.

Flowers 5- to 9-merous. Hypanthium campanulate to cup-shaped, always pubescent. Sepals usually short, conspicuously exceeded by the exterior teeth. Petals obovate. Stamens isomorphic; filaments smooth, slender; anthers subulate or linear, 2-celled; connective more or less elevated along the thecae, unappendaged, not prolonged at base or very briefly so. Ovary inferior only at base, 5- to 9-celled; style slender, elongate; stigma capitate to punctiform. Fruit a berry with numerous minute seeds. Shrubs or small trees of various aspect, with petiolate leaves and terminal panicles of large or medium-sized flowers.

Twelve species of tropical America, each of them, except the following, restricted in distribution.

1. Heterotrichum octonum (Bonpl.) DC. Prodr. 173. 1828.

Melastoma octonum Humb. & Bonpl. Melast. *7. t. 4.* 1816.

Shrub 1–5 m. tall; stem, petioles, panicle, and hypanthium densely covered with three types of pubescence, short, nearly sessile, stellate hairs, somewhat longer, projecting, glandular bristles, and elongate (4–8 mm.) simple bristles; petioles 3–8 cm. long; leaf-blades thin, ovate, 12–18 cm. long, half to two-thirds as wide, acuminate, denticulate, cordate at base, 7-nerved, setose above with long hairs, conescent-stellate beneath; panicle many-flowered, 5–10 cm. long; flowers 5- to 8-merous; sepals triangular-ovate, very short; exterior teeth subulate, 3–4 mm.

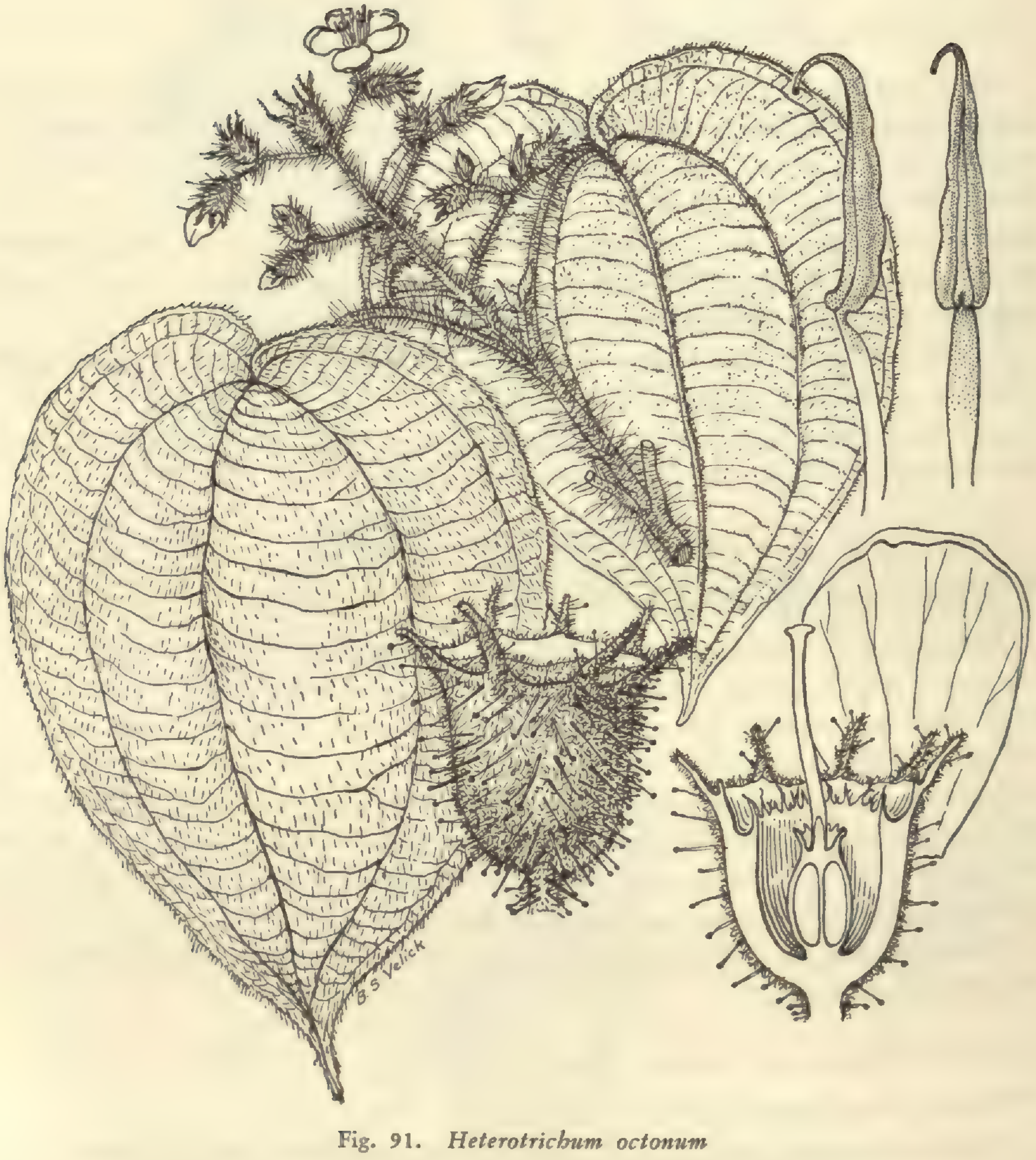

Fig. 91. *Heterotrichum octonum*

long; petals white, 8–10 mm. long; anthers subulate, 5–6 mm. long.

Southern Mexico to Peru and Brazil, at low or moderate elevations; also in Cuba.

BOCAS DEL TORO: Little Bocas, vicinity of Chiriquí Lagoon, *von Wedel 2492*. CANAL ZONE: Ancón Hill, vicinity of Balboa, *Seibert 400, Woodson, Allen & Seibert 1321*; Barro Colorado Island, *Aviles 22, Bangham 485*. CHIRIQUÍ: San Félix to Cerro Flor, 100–850 m., *Allen 1919*. DARIÉN: Marragantí and vicinity, *Williams 664*. PANAMÁ: San José Island, *Johnston 75, 1027, 1349, Erlanson 262*. PROVINCE UNKNOWN: *Hayes 223*.

32. MICONIA Ruiz & Pav.

MICONIA Ruiz & Pav. Fl. Peruv. & Chil. Prodr. 60. 1794.

Flowers 4- to 7- (commonly 5-)merous, in terminal paniculiform, spiciform, or rarely corymbiform inflorescences. Calyx open in the bud, usually with small but evident lobes and short, more or less adnate exterior teeth. Petals commonly white, mostly small, often inequilateral or retuse. Stamens isomorphic or dimorphic; anthers of various shapes, subulate, linear, oblong, or obovate, 2-celled or 4-celled, opening by 1, 2, or 4 terminal pores or the pore extended into 1 or 2 longitudinal slits; connective simple or variously lobed or appendaged. Ovary partly to wholly inferior; stigma truncate, capitate, or peltate. Fruit a many-seeded berry. Trees or shrubs of diverse size and habit.

At least 900 valid species, distributed throughout tropical America. The genus is ordinarily divided into twelve sections characterized by the shape and mode of dehiscence of the anthers and by the nature of the calyx; three of these are not represented in Panama. *Miconia* is closely related to several other genera, especially *Conostegia, Heterotrichum,* and *Tococa*. The characters by which these are distinguished from *Miconia* are far weaker than those which separate certain sections within the genus. Species of *Miconia* can seldom be identified satisfactorily without recourse to the structure of the anthers, although many of them may be recognized by various intangible characters not easily expressed in words. Two keys are provided below, the first almost wholly artificial, the second more technical; the two should be used together. Besides the species described here, a few others may be represented by flowerless material now in herbaria. No attempt has been made to include them in the keys. The flowers of one admitted species, *M. shattuckii*, are unknown and it is placed at the end without assignment to a section.

ARTIFICIAL KEY

a. Lower surface of the leaves distinctly and permanently pubescent or lepidote.
  b. Pubescence of stellate hairs or scales.
    c. Leaves sessile.
      d. Hypanthium and calyx together 2–3 mm. long; petals about 2.5 mm. long..... 11. M. IMPETIOLARIS.
      dd. Hypanthium and calyx together 7–9 mm. long; petals about 7 mm. long..... 5. M. AMPLEXANS.
    cc. Leaves petiolate.
      d. Flowers more or less secund along the branches of the inflorescence.
        e. Younger branches strongly flattened and sharply two-edged..... 10. M. ARGENTEA.
        ee. Younger branches terete or angled.

f. Petals entire..... 19. M. ALBICANS.
ff. Petals minutely glandular-ciliate..... 9. M. STENOSTACHYA.
dd. Flowers not at all secund.
f. Petals 8–10 mm. long; flowers commonly 6-merous; leaves usually pli-nerved.
g. Calyx-tube truncate or undulate; anthers oblong, blunt..... 28. M. SCHLIMII.
gg. Calyx-lobes about 3 mm. long, deciduous at anthesis; anthers subulate..... 2. M. MUCRONATA.
ff. Petals 2–3.5 mm. long; flowers 5-merous.
g. Leaves 5-nerved, caudate-acuminate, glabrous above..... 3. M. CAUDATA.
gg. Leaves 3-nerved, short-acuminate.
h. Leaves steliate above when young, soon glabrescent, permanently and densely ferruginous-stellate beneath. 22. M. RUBIGINOSA.
hh. Leaves minutely setose above, very sparsely stellate on the actual surface beneath..... 23. M. RUFOSTELLULATA.
bb. Pubescence entirely or chiefly of simple bristles (underlaid by stellate hairs in certain species; frayed or split at the apex in *M. barbinervis*).
c. Petals deep red, 6–8 mm. long; filaments 13–18 mm. long; style 15–25 mm. long..... 35. M. MELANOTRICHA.
cc. Petals white or pale, less than 5 mm. long; filaments and style much shorter.
d. Flowers sessile and secund along the branches of the inflorescence; hairs on the stem up to 8 mm. long; hypanthium glabrous; style bent to one side..... 27. M. LACERA.
dd. Flowers sessile in sessile, lateral, nearly or quite contiguous glomerules along the few branches of the inflorescence, forming a compound spiciform inflorescence; hypanthium pubescent; style straight..... 7. M. AERUGINOSA.
ddd. Flowers in paniculiform inflorescences, although often glomerulate; hypanthium glabrous or pubescent; style straight.
e. Pubescence of the stem, petioles, and primary veins distinctly ascending-strigose; leaves long-tapering to the base, the lateral veins arising 3–8 cm. from the base..... 19. M. NERVOSA.
ee. Pubescence of the stem retrorse-strigose; leaves 5-nerved..... 32. M. PITTIERI.
eee. Pubescence of the stem more or less spreading, certainly never conspicuously ascending or retrorse.
f. Leaves 7-nerved, cordate at the base..... 36. M. SHATTUCKII.
ff. Leaves 3- to 5-nerved or 3- to 5-pli-nerved, obtuse or rounded at the base.
g. pubescence of both stellate and simple hairs; leaves distinctly 5-pli-nerved..... 12. M. IBAGUENSIS.
gg. Pubescence of elongate matted hairs frayed or divided at the apex..... 13. M. BARBINERVIS.
ggg. Pubescence entirely of simple bristles.
h. Plants densely hirsute with red-purple hairs up to 3 mm. long; stigma minute, truncate..... 29. M. COSTARICENSIS.
hh. Plants hirsutulous with hairs up to 1 mm. long; stigma large, peltate, 4- to 5-angled or lobed..... 30. M. GONIOSTIGMA.
aa. Lower surface of mature leaves glabrous or essentially so. (Almost every species is somewhat stellate when young and a few minute hairs often persist on the veins.)
b. Leaves 3- to 5-pli-nerved.
c. Leaves long-tapering to the base.
d. Calyx-lobes sharply triangular..... 15. M. PRASINA.
dd. Calyx-lobes depressed-semicircular..... 16. M. PTEROPODA.
cc. Leaves acute to rounded at the base.
d. Petals 5–10 mm. long; anthers 4–6 mm. long.
e. Plants glabrous throughout; anthers subulate..... 4. M. HONDURENSIS.*
ee. Plants more or less stellate-pubescent on the younger stems, petioles, and hypanthium; anthers blunt..... 28. M. SCHLIMII.
dd. Petals 2–3 mm. long; anthers 2 mm. long or shorter.

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* See footnote on p. 296.

e. Anthers less than 1 mm. long..... 34. M. RUBENS.
ee. Anthers about 2 mm. long..... 33. M. CUSPIDATISSIMA.
bb. Leaves 3- to 5-nerved.
c. Flowers 4-merous.
d. Stem and leaves glabrous..... 1. M. LATERIFLORA.
dd. Stem and lower side of the leaf stellate..... 23. M. RUFOSTELLULATA.
cc. Flowers 5-merous.
d. Flowers secund along the branches of the inflorescence; style bent near the summit.
e. Leaves green, two-fifths to half as wide as long..... 25. M. CILIATA.
ee. Leaves purple-red beneath, a fourth to a third as wide as long. 26. M. OINOCHROPHYLLA.
dd. Flowers not at all secund.
e. Inflorescence slender and elongate.
f. Flowers sessile along the central axis of the spike-like inflorescence..... 6. M. TRIPLINERVIS.
ff. Flowers (at least the lower) sessile on short lateral branches, the uppermost often solitary on a lateral branch..... 8. M. GRACILIS.
ee. Inflorescence paniculiform.
f. Leaf-blades comparatively large, commonly half to two-thirds as wide as long.
g. Flowers pediceled; leaves caudate; anthers subulate..... 3. M. CAUDATA.
gg. Flowers sessile; leaves short-acuminate; anthers linear..... 14. M. CALVESCENS.
ff. Leaf-blades comparatively small, rarely up to 6 cm. wide, rarely as much as half as wide as long.
g. Leaves of an oblong or oblong-lanceolate type, commonly widest distinctly below the middle.
h. Fourth and fifth veins submarginal and relatively prominent..... 24. M. BOREALIS.
hh. Fourth and fifth veins strictly marginal and obscure..... 21. M. PANAMENSIS.
gg. Leaves of an oblong to obovate type, commonly broadest near or above the middle.
h. Lobes of the calyx small, but distinctly developed.
i. Nodes of the inflorescence marked by a ring of minute setae; anthers linear..... 17. M. HYPERPRASINA.
ii. Nodes of the inflorescence lacking setae; anthers oblong to obovate.
j. Smaller branches of the inflorescence angular and bisulcate..... 31. M. THEAEZANS.
jj. Smaller branches of the inflorescence terete or nearly so..... 33. M. CUSPIDATISSIMA.
hh. Lobes of the calyx obsolete..... 18. M. INSULARIS.

KEY TO THE SECTIONS

a. Anthers subulate, tapering to the summit, opening by a minute terminal pore; thecae commonly convolute.
b. Leaves petioled; connective glandular or glabrous.
c. Sepals or exterior teeth or both well developed in comparison with the hypanthium..... I. JUCUNDA (spp. 1–2).
cc. Sepals and exterior teeth poorly developed in comparison with the hypanthium..... II. TAMONEA (spp. 3–4).
bb. Leaves sessile; connective always dilated and glandular..... III. ADENODESMA (sp. 5).
aa. Anthers linear or broader, not tapering to the summit.
b. Anthers opening by a terminal pore.
c. Anthers slender, linear or slightly widened distally.
d. Pore minute, rarely more than half the width of the anther..... IV. MICONIA (spp. 6–23).
dd. Pore conspicuous, about as wide as the anther..... V. GLOSSOCENTRUM (sp. 24).
cc. Anthers oblong to obovate or obovoid.
d. Pore minute, much less than half as wide as the anther.
e. Anthers 2-celled; style abruptly bent near the summit. VI. HARTIGIA (spp. 25–27).
ee. Anthers 4-celled; style straight..... VII. AMBLYARRHENA (spp. 28–30).
dd. Pore at least half as wide as the anther, the septum between the thecae commonly protruding..... VIII. CREMANIUM (spp. 31–34).
bb. Anthers opening by two longitudinal clefts..... IX. CHAENOPLEURA (sp. 35).

I. Section JUCUNDA (Cham.) Tr. ex Benth. & Hook. f. Gen. Pl. 1:764. 1867

Anthers subulate, usually with convolute thecae, opening by a minute pore; connective simple or variously lobed or prolonged; either the sepals or the exterior teeth greatly developed and the calyx therefore apparently deeply lobed; exterior teeth often much exceeding the sepals and mistaken for them; leaves petioled (in our species).

Twenty known species, most numerous in Amazonia.

a. Sepals proper nearly obsolete, much surpassed by the narrowly triangular exterior teeth; flowers 4-merous; leaves 3-nerved..... 1. M. LATERIFLORA.
aa. Sepals 3–4 mm. long from the torus; exterior teeth minute; flowers mostly 6-merous; leaves 3- to 5-pli-nerved..... 2. M. MUCRONATA.

1. MICONIA LATERIFLORA Cogn. in Bol. Mus. Goeldi 5:255. 1909.

Ossaea disparilis Standley, in Contr. Arn. Arb. 5:120. *pl. 17*. 1933.
Miconia disparilis (Standley) R. O. Williams, in Dept. Agric. Trinidad & Tobago 1:388. 1934.

Shrub to 3 m. tall, the stems and leaves glabrous; petioles slender, 5–25 mm. long; leaf-blades shining, thin, elliptic, 10–25 cm. long, two-fifths to half as wide, slenderly acuminate or caudate, obscurely crenulate and sparsely ciliate, obtuse to broadly cuneate at base, 3-nerved; panicle loose and open, sparsely branched; flowers predominantly 4-merous, sessile in small terminal glomerules; hypanthium tubular, becoming ovoid in fruit, glabrous or minutely punctate, 3.5–4 mm. long; calyx-lobes nearly obsolete; exterior teeth narrowly triangular, 1.5–2 mm. long; petals obovate, 1.5–2 mm. long; stamens isomorphic, the anthers subulate, 3–3.5 mm. long; connective minutely 4-lobed at base; ovary nearly free, 4-celled; stigma truncate; fruit strongly 8-costate, sometimes glandular-pilose.

British Honduras to Panama, Colombia, Trinidad, Surinam, and northern Brazil.

BOCAS DEL TORO: Fish Creek, *von Wedel 2230*; Water Valley, *von Wedel 1470*; Buena Vista Camp on the Chiriquí trail, 375 m., *Cooper 593*. CANAL ZONE: Barro Colorado Island, *Aviles 21*, *Bailey & Bailey 201*, *506*; Frijoles, *Standley 27553*. DARIÉN: Cana-Cuasi trail, Chepigana district, 600 m., *Terry & Terry 1455*.

2. MICONIA MUCRONATA (Desr.) Naud. in Ann. Sci. Nat. Bot. III. 16:120. 1851.

Melastoma holosericea L. Sp. Pl. 390. 1753.
Melastoma mucronata Desr.; Lam. Encyc. 4:46. 1796.
Miconia holosericea Triana, Trans. Linn. Soc. 28:101. 1871. Not M. *holosericea* DC. 1828.

Shrub or small tree to 5 m. tall, the smaller twigs somewhat flattened, very finely tomentulose, as are also the petioles, lower leaf-surface, panicle, and hypanthia; petioles 1.5–2.5 cm. long; leaf-blades broadly elliptic, varying to ovate or obovate, up to 4 dm. long, a third to half as wide, abruptly short-acuminate, entire, obtuse to rounded at base, glabrous above, 3- to 5-nerved or 3- to 5-pli-nerved; panicle to 15 cm. long, rather few-flowered; flowers commonly 6-merous, sessile; hypanthium tubular, about 6 mm. long; sepals ovate to lanceolate, 2.5–3.5 mm. long, deciduous at anthesis; petals obovate-oblong, 8–10 mm. long; stamens iso-

morphic; anthers subulate, 6–8 mm. long, the connective prolonged into two obtuse basal lobes and a short erect dorsal spur; ovary almost free; style about 18 mm. long; stigma truncate.

British Honduras and Panama; in South America south to southern Brazil and Bolivia.

CHIRIQUÍ: vicinity of San Félix, 0–120 m., *Pittier 5261*.

II. Section TAMONEA Cogn. in Mart. Fl. Bras. 14[4]:238. 1887.

Anthers subulate, usually with convolute thecae, opening by a minute terminal pore; connective usually simple, occasionally very briefly prolonged and lobed, rarely glandular; calyx-tube well developed but scarcely lobed, the exterior teeth none or minute.

About 50 species, most numerous in Amazonia.

a. Leaves ovate, usually (not always) cinereous beneath, glabrous above; hypanthium cinereous-tomentulose..... 3. M. CAUDATA.
aa. Leaves oblong or oblong-obovate; plant glabrous throughout..... 4. M. HONDURENSIS.

3. MICONIA CAUDATA (Bonpl.) DC. Prodr. 3:187. 1828.

Melastoma caudata Humb. & Bonpl. Melast. 13. *t. 7*. 1807.

Shrub or small tree to 12 m. tall, the younger stems ferruginous-stellate-tomentose, glabrescent in age; petioles slender, 2–5 cm. long; leaf-blades firm, ovate, 1–2 dm. long, about half as wide, caudate-acuminate, entire, broadly rounded at base, 5-nerved, glabrous and dull green above, beneath varying from cinereous with a close tomentum of stellate hairs to completely glabrous; panicle 5–10 cm. long, compact, much branched, the flowers in small terminal glomerules; hypanthium campanulate, about 2.5 mm. long to the torus, cinereous-stellate, calyx-tube about 0.5 mm. long, obscurely 5-lobed; petals white, obovate, 3–3.5 mm. long, stellulate externally; stamens isomorphic or somewhat dimorphic; anthers stoutly subulate, 4–4.5 mm. long, somewhat incurved, with convolute thecae; connective simple or elevated into a dorsal ridge near the base, smooth or beset with sessile glands; filaments smooth or villosulous; style often villosulous.

Southern Mexico to Ecuador.

CHIRIQUÍ: Boquete, 1350 m., *Maxon 5145, Terry 1278*. COCLÉ: region of El Valle de Antón, 1000 m., *Allen 3734*.

4. MICONIA HONDURENSIS Donn. Sm. in Bot. Gaz. 40:3. 1905.

Miconia gatunensis Pittier, in Journ. Wash. Acad. Sci. 14:447. 1924.

Shrub to 4 m. tall, glabrous throughout; petioles 1–2 cm. long; leaf-blades oblong to oblong-obovate, up to 20 cm. long and 8 cm. wide, abruptly caudate-acuminate, entire, narrowed to an obtuse base, minutely but densely verruculose-puncticulate above, slightly 3-pli-nerved; panicle pyramidal, 5–15 cm. long, the flowers mostly in clusters of three at the end of the branches, the terminal on a pedicel about 2 mm. long, the lateral sessile at the end of a very short branch; hypanthium narrowly campanulate, 3.5–4 mm. long; calyx-tube slightly flaring,

about 1 mm. long, the lobes nearly obsolete, the exterior teeth lacking; petals white, oblong-elliptic, retuse, about 5 mm. long; stamens dimorphic; filaments about 6 or about 3.5 mm. long; anthers subulate, with obscurely convolute thecae, the larger nearly straight, about 6 mm. long, the smaller incurved, about 5 mm. long; connective thickened toward the base and curved around the base of the thecae as two small lateral lobes; style slender, about 12 mm. long; stigma capitellate.

British Honduras to Panama.

CANAL ZONE: along the Río Indio de Gatún, near sea-level, *Pittier 2786.* DARIÉN: Tucuti, Chepigana district, about 15 m., *Terry & Terry 1373.*

III. Section ADENODESMA Naud. ex Cogn. in Mart. Fl. Bras. 14[4]:253. 1887.

Anthers subulate, usually strongly arcuate, opening by a small terminal pore; thecae convolute; connective expanded at the base, prolonged and variously lobed below the filament, glandular; leaves pli-nerved, usually sessile.

Eleven known species, all but two Amazonian. Only the following species in Panama.

5. MICONIA AMPLEXANS (Crueg.) Cogn. in Mart. Fl. Bras. 14[4]:256. 1887.

Pogonorhynchus amplexans Crueg. in Linnaea 20:107. 1847.

Shrub or small tree to 8 m. tall, the younger stems closely brown-tomentose with stellate hairs; leaves sessile, firm in texture, obovate, up to 4 dm. long and about half as wide, abruptly acuminate, narrowed from above the middle to a rounded or auriculate base, 3-pli-nerved, the lateral nerves arising 5–10 cm. above the base, soon glabrescent above, beneath permanently thinly stellate-pubescent; inflorescence narrow, 1–2 dm. long, stellate-tomentose; hypanthium tubular-campanulate, 5.5–6 mm. long to the torus, finely stellate-tomentose; calyx-tube prolonged 1–1.5 mm.; sepals 0.5–1 mm. long from the sinus, semicircular; petals white, inequilateral, oblong-obovate, about 7 mm. long; stamens only slightly dimorphic; anthers slenderly subulate, about 6 or about 8 mm. long, the connective at base glandular-pubescent and curved into a half-circle below the thecae; filaments sparsely glandular; ovary glandular; stigma truncate.

British Honduras, Trinidad, and Panama, and southward at low elevations in South America to Bolivia.

PROVINCE UNKNOWN: *Hayes 972.*

IV. Section MICONIA

Anthers elongate, linear, opening by a terminal pore seldom half as wide as the anther, 2-celled; connective simple in a few species, usually more or less prolonged below the thecae into various types of lobes or appendages.

About 250 species, distributed over the entire range of the genus but most numerous in Amazonia. The nature of the connective, upon which the major divisions of the key are based, can not be determined from dried anthers; they must first be restored to natural form by brief boiling.

a1. Connective of the episepalous stamens simple at the base, not prolonged below the thecae..... 6. M. TRIPLINERVIS.
a2. Connective of the episepalous stamens prolonged below the thecae into two deflexed lateral lobes.
b. Lateral branches from the central axis of the inflorescence themselves unbranched.
c. Lateral branches of the panicle bearing sessile (often contiguous) glomerules of flowers; pubescence of simple bristles..... 7. M. AERUGINOSA.
cc. Lateral branches of the panicle bearing a few sessile solitary flowers; plants nearly or quite glabrous throughout..... 8. M. GRACILIS.
bb. Lateral branches from the central axis of the inflorescence also branched.
c. Flowers secund along the ultimate branches of the panicle; leaves cinereous beneath.
d. Petals glandular-ciliate; upper internodes strongly angled but not two-edged..... 9. M. STENOSTACHYA.
dd. Petals not glandular; upper internodes strongly flattened and sharply two-edged..... 10. M. ARGENTEA.
cc. Flowers not secund; leaves glabrous, stellate, or pubescent beneath, or ferruginous in one species only.
d. Leaves closely sessile by a broad base, permanently stellate beneath..... 11. M. IMPETIOLARIS.
dd. Leaves petioled, or the blade long-cuneate at base and decurrent along the petiole.
e. Younger stems and lower leaf-surface hirsute (the bristles may be stellate or branched at the summit).
f. Leaves 5-pli-nerved, glabrous or nearly so above..... 12. M. IBAGUENSIS.
ff. Leaves 3-nerved, hirsute above..... 13. M. BARBINERVIS.
ee. Younger stems and lower leaf-surfaces glabrous or obscurely pubescent with minute stellate hairs.
f. Leaves broadly rounded to cordate at base, 3- to 5-nerved; stigma capitate..... 14. M. CALVESCENS.
ff. Leaves gradually narrowed at base and cuneate into a decurrent petiole; stigma truncate.
g. Calyx-lobes triangular, nearly or quite equaled by the triangular external teeth..... 15. M. PRASINA.
gg. Calyx-lobes depressed-semicircular; exterior teeth obsolete or represented by minute thickenings..... 16. M. PTEROPODA.
a3. Connective of the episepalous stamens dilated at base to the width of the thecae, decurved around the filament and prolonged below the thecae as a more or less tubular organ.
b. Leaves sessile by a broad base, permanently stellate beneath..... 11. M. IMPETIOLARIS.
bb. Leaves petioled, glabrous or obscurely and minutely stellate beneath.
c. Inflorescence branches and branchlets usually opposite; calyx lobes distinct, the external teeth projecting..... 17. M. HYPERPRASINA.
cc. Inflorescence branches and branchlets whorled, 3–6 per node; calyx truncate, the external teeth nearly obsolete..... 18. M. INSULARIS.
a4. Connective not dilated at base, prolonged straight back above the filament as a single dorsal lobe..... 19. M. NERVOSA.
a5. Connective of the episepalous stamens prolonged below the thecae and dilated into a broad, oblique, cordate structure with the apex of the filament in its sinus.
b. Stamens isomorphic or nearly so; flowers secund on the ultimate branches of the panicle; leaves closely cinereous-tomentose beneath..... 20. M. ALBICANS.
bb. Stamens dimorphic; flowers not secund.
c. Panicle large and well developed, terminating the main axis of the leafy branches.
d. Younger stems and lower leaf-surfaces thinly and sparsely pubescent with stellate hairs..... 21. M. PANAMENSIS.
dd. Stems and lower leaf-surfaces densely and permanently pubescent with ferruginous stellate hairs..... 22. M. RUBIGINOSA.
cc. Panicles small and several, terminating short, divaricate, two-leaved, lateral branches..... 23. M. RUFOSTELLULATA.

6. MICONIA TRIPLINERVIS Ruiz & Pav. Syst. Veg. 1:105. 1798.

Miconia angustispica Blake, in Contr. U. S. Natl. Herb. 24:15. *pl. 5.* 1922.

Shrub or small tree to 10 m. tall, the younger parts, including the leaves, more or less stellate-tomentose when young, glabrescent in age; petioles slender, 5–15 mm. long; leaf-blades thin, oblanceolate to obovate, up to 25 cm. long, a third to half as wide, abruptly but conspicuously acuminate, entire, gradually narrowed below to an obtuse or acute base, 3-nerved; inflorescence normally a single, elongate, spiciform cluster 1–2 dm. long, floriferous nearly to the base, the flowers sessile in lateral glomerules of 2–4; hypanthium campanulate, 2.5 mm. long to the torus, thinly stellate-pubescent; calyx about 0.5 mm. long, nearly truncate; exterior teeth none; petals white, 1.5–2 mm. long, thinly stellulate on both sides; stamens isomorphic; anthers 2.5–3 mm. long, somewhat incurved, with convolute thecae and simple connective.

Southern Mexico and Jamaica to Brazil. Panama plants, segregated as a distinct species by Blake, have in general larger, proportionately broader leaves and a denser tomentum than typical plants of Amazonia.

BOCAS DEL TORO: Fish Creek, *von Wedel 2197*; Isla Colón, *von Wedel 1929*; region of Almirante, *Cooper 161*.

7. MICONIA AERUGINOSA Naud. in Ann. Sci. Nat. Bot. III. 16:135. 1851

Shrub or small tree to 6 m. tall, the stems, petioles, both sides of the leaves, panicle, and hypanthia more or less hirsute with straight simple hairs, also (except the upper side of the leaf) more or less finely stellate-tomentulose; petioles stout, 1–3 cm. long, more densely hirsute on the upper side; leaf-blades ovate or oblong-ovate, up to 20 cm. long, half to two-thirds as wide, acuminate, commonly dentate, broadly rounded or subcordate at base, 7-nerved, the outer pair nearly marginal, sparsely hirsute above; panicle with a central axis up to 15 cm. long, with several simple branches bearing small sessile glomerules, often contiguous, of sessile flowers; hypanthium obconic, about 2 mm. long to the torus; calyx-tube prolonged about 0.5 mm., its lobes depressed-triangular, minute; exterior teeth subulate, barely surpassing the lobes; petals white, obovate-oblong, 3.5–4 mm. long; stamens dimorphic; anthers linear, about 2 or about 2.5 mm. long, connective of the smaller ones simple, that of the larger prolonged at base into two small lateral lobes; stigma truncate.

Southern Mexico to Colombia and Venezuela.

CHIRIQUÍ: vicinity of El Boquete, 1140–1300 m., *Davidson 604, 724, Pittier 2997*; Finca Lérida to Boquete, 1300–1700 m., *Woodson, Allen & Seibert 1143*. COLÓN: Monk[ey?] Hill, *Kuntze s. n.*

8. MICONIA GRACILIS Triana, in Trans. Linn. Soc. 28:107. 1871.

Shrub to 5 m. tall, glabrous or essentially so throughout; petiole 5–10 (rarely 25) mm. long; leaf-blades thin, bright green up to 10 cm. long, oblong or elliptic, a third to nearly half as wide, the members of a pair often unequal, acuminate to a blunt tip, entire, acute at the base, 3-nerved; panicles slender, up to 15 cm. long

and 2 cm. in diameter, the numerous short branches seldom again branched and bearing 1–5 sessile flowers; hypanthium campanulate, 3 mm. long, costate in fruit; calyx closed in bud, at anthesis ruptured nearly to the torus into 3–5 broadly triangular lobes; exterior teeth none; petals white, obovate-oblong, 3 mm. long; stamens nearly isomorphic, differing in size; anthers linear, 2.5–3 or 3.5–4 mm. long, the connective very briefly prolonged below the thecae into two lateral lobes, stigma capitate.

Nicaragua to Colombia.

BOCAS DEL TORO: Fish Creek, *von Wedel 2190, 2196, 2234*; Old Bank Island, *von Wedel 1922, 2166*. COCLÉ: vicinity of El Valle, *Allen 237*.

9. MICONIA STENOSTACHYA DC. Prodr. 3:181. 1828.

Shrub or small tree to 6 m. tall, the younger branches, petioles, lower leaf-surface, panicle, and hypanthia thinly cinereous-tomentulose; branches strongly angled; petioles 1–4 cm. long; leaf-blades thin, oblong or ovate-oblong, 8–18 cm. long, about two-fifths as wide, obtuse to abruptly short-acuminate, entire, rounded at the base, glabrous above, 3- to 5-nerved; panicle usually dense, up to 15 cm. long; flowers sessile and secund; hypanthium campanulate, about 3 mm. long; calyx-tube scarcely prolonged, the calyx-lobes broadly triangular; petals 3–5 mm. long, ovate, minutely glandular-ciliate; stamens isomorphic; anthers linear, about 4 mm. long, the connective barely prolonged below the thecae into two deflexed lateral lobes and one minute dorsal lobe; stigma conic or punctiform.

Southern Mexico and Trinidad to Bolivia and southern Brazil.

CANAL ZONE: vicinity of Summit, *Allen 4556*; road to Corozal, *Gervais 142*.

10. MICONIA ARGENTEA (Sw.) DC. Prodr. 3:182. 1828.

Melastoma argentea Sw. Prodr. Veg. Ind. Occ. 70. 1788.

Tall shrub or tree to 15 m. tall, the younger stems, petioles, lower leaf-surface, panicle, and hypanthia thinly but completely canescent with stellate hairs; younger stems strongly flattened and two-edged; petioles stout, 2–6 cm. long; leaf-blades firm, broadly elliptic, up to 25 cm. long, about half as wide, abruptly short-acuminate, entire or denticulate, obtuse to rounded at base, 5-nerved, glabrous above; panicle widely branched, 1–2 dm. long; flowers sessile, 5-merous; hypanthium obconic, about 2 mm. long; calyx almost truncate, the obscure lobes 0.2 mm. long; petals inequilateral, obovate-oblong, 3 mm. long; connective of the larger stamens prolonged at base into two small lateral lobes, that of the smaller stamens unlobed at base or with a minute dorsal lobe only; terminal pore large, as wide as the anther; stigma capitate.

Southern Mexico to Panama.

CANAL ZONE: Barro Colorado Island, *Aviles 31, Brown 133, 150, Wilson 104, Woodworth & Vestal 315, Zetek 4636*; Río Agua Salud, near Frijoles, *Piper 5854*; Gatún, *Cowell 295, Hayes 6, 469, Maxon 4792*; Cerro Galero, *Stern & Chambers 30*. CHIRIQUÍ: Boquete district, 1200 m., *Davidson 690*; El Pedregal de David, near sea-level, *Pittier 5116*. COCLÉ: vicinity of El Valle de Antón, 700–1000 m., *Allen 102, 2480*; Penonomé and vicinity,

Williams 215. COLÓN: Juan Mina plantation, Río Chagres above Gamboa, 25 m., *Allen 4154*. DARIÉN: vicinity of La Palma, 0–50 m., *Pittier 5492*. PANAMÁ: Trapiche, Perlas Islands, on sea beaches, *Allen 2615*; San José Island, *Johnston 536, 637, 766, Erlanson 28, 175, 218*. SAN BLAS: Permé, *Cooper 657*. VERAGUAS: Santa Fé to Río Santa Marta, 300 m., *Allen 4418*.

11. MICONIA IMPETIOLARIS (Sw.) D. Don, in Mem. Wern. Soc. 4:316. 1823.

Melastoma impetiolaris Sw. Prodr. Veg. Ind. Occ. 70. 1788.

Shrub or small tree, the younger stems, petioles, lower leaf-surface, inflorescence, and hypanthia cinereous or ferruginous with stellate hairs; leaves sessile, oblanceolate to obovate, up to 4 dm. long, a third to half as wide, abruptly short-acuminate, entire or denticulate, rounded to a cordate-clasping base, glabrous above at maturity; panicle large, divaricately branched; flowers 5-merous, sessile in small glomerules; hypanthium cup-shaped to obconic, 1.5–2.5 mm. long; calyx-tube prolonged about 0.5 mm., nearly truncate, often erose; exterior teeth broadly triangular, adnate, projecting about 0.2 mm.; petals white, about 2.5 mm. long; stamens weakly dimorphic; ovary 3-celled, half-inferior; style slender, 8–10 mm. long; stigma truncate.

Southern Mexico to Panama; West Indies and (in a variety) northwestern South America. The two varieties described below are clearly distinct in Panama and other parts of Central America but intergrade almost completely in the West Indies.

Var. IMPETIOLARIS.

Leaves 3-nerved or 3-pli-nerved with an additional marginal pair; hairs of the lower leaf-surface not contiguous, exposing the surface; secondary veins commonly 35 or fewer on each side of the midvein, the middle ones diverging at an angle of about 75°; upper leaf-surface not punctate; connective dilated at base into two small lateral lobes.

BOCAS DEL TORO: banks of the Chaguinola River, *Dunlap 522*. CANAL ZONE: Barro Colorado Island, *Wilson 62, Woodworth & Vestal 597*; between Mt. Hope and the Santa Rita Trail, *Cowell 66*; Santa Rita Trail, *Cowell 112*.

Var. PANDURIFOLIA Naud. in Ann. Sci. Nat. ser. 3. 16:137. 1851.

Leaves 5-nerved or 5-pli-nerved with an additional marginal pair; hairs of the lower leaf-surface with interlaced arms, forming a continuous indument; secondary veins commonly 40 or more on each side of the midvein, the middle ones diverging almost at right angles; upper leaf-surface minutely verruculose-punctate; connective dilated into a large, more or less erose-margined lobe extending over the back and deflexed over the sides of the base of the anther.

BOCAS DEL TORO: Quebra Nigua, *von Wedel 2740*; Snapper Point, *von Wedel 2643*; Water Valley, *von Wedel 816, 890, 1412, 1734, 1742*. CANAL ZONE: Chagres, *Fendler 29*; vicinity of Summit, 150 m., *Allen 4518*; Naval Amm. Depot, Group 300 Road, *Stern & Chambers 37*. DARIÉN: headwaters of Río Chico, 150–225 m., *Allen 4599*. PANAMÁ: vicinity of Bella Vista, *Macbride 2747, Piper 5332*; San José Island, *Johnston 690, Erlanson 72, 239*. PROVINCE UNKNOWN: *Kuntze s. n., von Wedel 816*.

12. MICONIA IBAGUENSIS (Bonpl.) Triana, in Trans. Linn. Soc. 28:110. 1871.

Melastoma ibaguense Humb. & Bonpl. Melast. 105. *t. 45.* 1816.

Shrub to 6 m. tall, the younger stems and petioles stellate-tomentose and also more or less densely hirsute; petioles 3–10 mm. long; leaf-blades firm, oblong to oblong-lanceolate, up to 15 cm. long, a third to nearly half as wide, acuminate, entire to minutely serrulate, obtuse or rounded at the base, 5-pli-nerved, the veins usually conspicuously impressed, sparsely stellate above when young, later nearly or quite glabrous, below hirsutulous with simple hairs; panicle compact, up to 1 dm. long, more or less hirsute, the sessile flowers commonly crowded toward the ends of the branches; hypanthium campanulate, 2.5–3 mm. long, finely stellate and sparsely hirsute; calyx-tube about 0.7 mm. long, its lobes minute, triangular, about equaled by the exterior teeth; petals white, obovate, about 4 mm. long; stamens somewhat dimorphic; anthers linear 3–3.5 or 4–4.5 mm. long, the connective expanded below the thecae into two lateral lobes, somewhat deflexed on the smaller anthers, curved forward on the larger ones; summit of the ovary commonly setose; stigma capitate.

Widely distributed from southern Mexico and Cuba to southern Brazil and Bolivia.

CHIRIQUÍ: savannas, Boquete district, 1200 m., *Davidson 687*; rocky plains near Boquete, *Allen 4688*. PANAMÁ: San José Island, *Erlanson 281*. VERAGUAS: trail between Cañazas and the foot of the Cordillera Central, 300–600 m., *Allen 170*.

13. MICONIA BARBINERVIS (Benth.) Triana, in Trans. Linn. Soc. 28:113. 1871.

Clidemia barbinervis Benth. Bot. Voy. Sulphur 95. 1844.

Shrub to 4 m. tall, the stems, petioles, lower leaf-surface, panicle, and hypanthia densely hirsute or tomentose with straight or matted bristles 0.7–4 mm. long and stellate or frayed at the summit; petioles stout, 5–20 mm. long; leaf-blades ovate-lanceolate, oblong, or somewhat obovate-oblong, a third to two-fifths as wide, acuminate, more or less saliently dentate, 3-nerved, hirsute above with usually simple, rarely stipitate-stellate hairs; panicle pyramidal, up to 1 dm. long; flowers 5- to 6-merous, sessile in terminal few-flowered glomerules, each subtended by a small obovate-oblong bract; hypanthium nearly cylindric, 3.7 mm. long; calyx-tube prolonged about 0.5 mm.; calyx-lobes triangular, blunt, considerably surpassed by the subulate exterior teeth; petals oblong-obovate, about 4 mm. long, unsymmetrical; stamens essentially isomorphic but unequal, the anthers 4–5 mm. or 3–4 mm. long; connective continued at base into two rounded lateral lobes; stigma capitate, about 1 mm. wide.

Nicaragua to Panama; at low elevations in northern South America to Peru and Pará.

BOCAS DEL TORO: Water Valley, *von Wedel 905, 1581*.

14. MICONIA CALVESCENS DC. Prodr. 3:185. 1828.

Small tree to 10 m. tall, the younger branches and base of the panicle some-

what flattened, thinly cinereous with minute stellate hairs; petioles 3–6 cm. long; leaf-blades elliptic to obovate-oblong, 15–35 cm. long, half to two-thirds as wide, abruptly short-acuminate, entire or undulate, obtuse to broadly rounded at base, 3-nerved with an additional pair of marginal veins, pubescent when young, soon glabrescent, or with a few stellate hairs persistent along the veins beneath; panicles 1–3 dm. long, divaricately branched, thinly cinereous-tomentulose; flowers sessile in small lateral and terminal glomerules, 5-merous; hypanthium about 2 mm. long, thinly tomentulose; calyx-tube prolonged about 0.5 mm., sepals broadly triangular, about 0.3 mm. long; petals obovate, white, 2.5–3 mm. long; stamens nearly isomorphic; anthers linear, 2–2.5 or 3–3.5 mm. long; connective very briefly prolonged below the thecae into two deflexed lateral lobes; stigma capitate.

British Honduas to Panama, and southward to Bolivia and southern Brazil.

DARIÉN: Cana-Cuasi trail, Chepigana district, 600 m., *Terry & Terry 1492*.

15. MICONIA PRASINA (Sw.) DC. Prodr. 3:188. 1828.

Melastoma prasina Sw. Prodr. Veg. Ind. Occ. 69. 1788.
Miconia darienensis Pittier in Contr. U. S. Natl. Herb. 18:248. 1917.

Shrub or small tree, reported to 10 m. tall, the younger branches, lower leaf-surface, panicle, and hypanthia very minutely and sparsely stellate-furfuraceous; petioles 5–20 mm. long; leaf-blades firm in texture, oblong or lanceolate, commonly 1–2 dm. long and a third to two-fifths as wide, acuminate, entire or somewhat undulate, acuminate or acute at base and often decurrent on the petiole, usually completely glabrous above, 3- to 5-pli-nerved; panicle pyramidal, up to 15 cm. long; flowers sessile or nearly so, tending to be crowded toward the ends of the branches; hypanthium narrowly campanulate, 2–2.5 mm. long; calyx-tube prolonged about 0.5 mm.; calyx-lobes triangular, acute or obtuse, 0.2–0.4 mm. long; petals white, obovate, 2.5–3 mm. long; stamens somewhat dimorphic; anthers linear, 3–3.5 or 2.5–3 mm. long, the connective prolonged at base below the thecae into two deflexed lateral lobes; style slightly dilated upward to the truncate stigma.

Abundant, widely distributed, and highly variable throughout tropical America from southern Mexico and the West Indies to Paraguay and Bolivia.

BOCAS DEL TORO: Fish Creek Mountains, *von Wedel 2293*. CANAL ZONE: Chagres, *Fendler 32*; Río Gatún, *Hayes 390*. DARIÉN: Garachiné, *Pittier 5478*.

16. MICONIA PTEROPODA Benth. in Hook. Journ. Bot. 2:314. 1840.

Shrub to 9 m. tall, the younger parts of the stem, panicle, and hypanthia tomentulose with minute brown stellate hairs; leaves firm in texture, narrowly oblong-elliptic, up to 25 cm. long, a fifth to a third as wide, acuminate to a blunt tip, entire or somewhat undulate, abruptly cuneate below into a narrow wing extending to the stem, strongly 5-pli-nerved, at maturity glabrous above and on the surface beneath, minutely furfuraceous along the veins beneath; panicle 1–2 dm. long; flowers sessile; hypanthium cup-shaped, 2.5–3 mm. long to the torus; calyx-tube prolonged about 0.5 mm., its lobes depressed-semicircular, about 0.2 mm. long from the sinuses; petals obovate, about 3 mm. long, densely furfura-

ceous; stamens slightly dimorphic; anthers 3.2–3.7 mm. or 2.6–3 mm. long, linear; connective prolonged into two lateral lobes at base, slender and rounded on the smaller anthers, on the larger flat and truncate; stigma truncate. Perhaps not distinct from the preceding species.

British Honduras to Panama; widely distributed in northern South America.

CANAL ZONE: vicinity of Summit, 150 m., *Allen 4519*. CHIRIQUÍ: Boquete, *Davidson 679, 838*; San Félix, *Pittier 5258*. COCLÉ: south of El Valle de Antón, 600–800 m., *Allen 2852*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1307*; Bismarck above Penonomé, 600–900 m., *Williams 552*. PANAMÁ: Bella Vista, *Macbride 2742*; San José Island, *Johnston 760, 770, 1111, Erlanson 89, 265*.

17. MICONIA HYPERPRASINA Naud. in Ann. Sci. Nat. Bot. III. 16:186. 1851.

Shrub or small tree to 8 m. tall, the younger stems, petioles, inflorescence, and hypanthia thinly but closely stellate with minute brownish hairs; petioles 1–2 cm. long; leaf-blades commonly oblong-lanceolate, varying to oblong or somewhat oblanceolate, 1–2 dm. long, a fourth to a third or rarely half as wide, acuminate, entire or undulate, acute or somewhat obtuse at base, glabrous above, glabrous or very sparsely furfuraceous along the veins beneath, 3-nerved, often also with conspicuous marginal veins, the veins beneath often pale; panicle widely branched, up to 10 cm. long, always minutely setulose at the nodes, bractless; flowers sessile; hypanthium cup-shaped, about 2 mm. long to the torus; calyx-lobes nearly semicircular, 0.5–0.8 mm. long; exterior teeth small, conic; petals white, obovate, 2–2.5 mm. long; anthers dimorphic; anthers about 3 or about 2.5 mm. long, the connective of the larger expanded at base into a large lobe with its sides curved around the filament and its margins meeting beneath, that of the smaller prolonged at base into a narrow short dorsal lobe and two minute lateral lobes; stigma truncate.

Southern Mexico to Panama.

BOCAS DEL TORO: Old Bank Island, *von Wedel 1881, 1973, 2065*; vicinity of Chiriquí Lagoon, *von Wedel 1244*; Water Valley, *von Wedel 1711*; Buena Vista Camp on the Chiriquí trail, 375 m., *Cooper 580*. CANAL ZONE: Barro Colorado Island, *Frost 224, Woodworth & Vestal 434*; Frijoles, *Piper 5825*. COCLÉ: Bismarck, above Penonomé, *Williams 553*. DARIÉN: Cana and vicinity, 600–1950 m., *Williams 981*. PANAMÁ: San José Island, *Johnston 668, 762, 1133, Erlanson 88, 96, 138, 229, 266*. SAN BLAS: Permé, *Cooper 635, 635a*.

18. MICONIA INSULARIS Gl. in Sargentia 8:234. 1949.

Shrub to 4 m. tall, the younger branches minutely and sparsely stellate-canescent; petioles 1–2 cm. long; leaf-blades elliptic or oblong, 10–16 cm. long, about two-fifths as wide, acuminate to a blunt tip, entire or somewhat sinuate, acute at the base, glabrous and puncticulate above, glabrous beneath, 3-nerved; panicle about 1 dm. long and usually somewhat wider, branched from the base; flowers sessile or very shortly pediceled; hypanthium 1.3 mm. long to the torus, sparsely and minutely stellate; calyx-tube prolonged 0.4 mm., truncate, the minute exterior teeth scarcely projecting; petals white, oblong, 3–3.5 mm. long; anthers dimorphic, about 3 or about 2.5 mm. long, the connective of the larger expanded at base into a large dorsal lobe with its sides deflexed around the filament, that of the smaller

prolonged at base into one dorsal and two lateral lobes about equal in size; stigma truncate.

Endemic to Panama.

PANAMÁ: San José Island, *Johnston 448, Erlanson 403, 573.*

19. MICONIA NERVOSA (Sm.) Triana, in Trans. Linn. Soc. 28:111. 1871.

Melastoma nervosum Sm. in Rees, Cycl. 23: *Melastoma* n. 31. 1819.
Miconia septuplinervia Pittier, in Bol. Soc. Venez. Cienc. Nat. 11:26. 1947.

Shrub to 6 m. tall, the younger stems, petioles, panicle, and primary nerves of the leaves densely strigose; petioles 1–2 cm. long; leaf-blades thin, elliptic or oblong, up to 25 cm. long, a third to half as wide, often unequal in each pair, acuminate or rarely acute, entire or nearly so, long-cuneate at the base, 5- to 7-plinerved, the inner pair of lateral nerves arising 2–8 cm. from the base, sparsely pubescent on the upper surface, softly pubescent or subsericeous on the lower; panicle commonly elongate, 5–15 cm. long, the flowers mostly sessile in lateral glomerules, occasionally on short lateral branches; hypanthium narrowly campanulate, 3.5–4 mm. long, densely strigose; calyx-tube about 0.5 mm. long; sepals minute, triangular; petals white, oblong-obovate, 3–3.5 mm. long; stamens isomorphic; anthers linear, straight, 3.5–4 mm. long, the connective prolonged straight back into a single dorsal appendage 0.2–0.3 mm. long; ovary pubescent; style about 6 mm. long; stigma truncate.

In regions of heavy rainfall, southern Mexico to Panama; southward to Peru and eastward through the Amazon valley.

BOCAS DEL TORO: Water Valley, *von Wedel 804, 1425, 1467*; Changuinola Valley, *Dunlap 131*; Talamanca Valley, *Carleton 131*. CANAL ZONE: Chagres, *Fendler 35*; Gatún, *Hayes 224*. CHIRIQUÍ: San Félix, *Pittier 5175*. DARIÉN: Cana-Cuasi trail, Chepigana district, 600 m., *Terry & Terry 1521*. PROVINCE UNKNOWN: *Moore 23*.

20. MICONIA ALBICANS (Sw.) Triana. Trans. Linn. Soc. 28:116. 1871.

Melastoma albicans Sw. Prodr. Veg. Ind. Occ. 70. 1788.

Shrub or small tree to 6 m. tall; younger branches finely cinereous-tomentulose, soon glabrescent; petioles stout, tomentulose, 5–15 mm. long; leaf-blades subcoriaceous, oblong, ovate-oblong, or elliptic, 7–15 cm. long, about two-fifths as wide, obtuse to short-acuminate, entire, emarginate or subcordate at base, 5-nerved, the outer pair commonly submarginal, above when mature glabrous, dark green, and shining, beneath closely and finely cinereous-tomentulose; panicle 8–20 cm. long, freely branched, cinereous or ferruginous; flowers 5-merous, sessile, secund and alternate on the ultimate branches of the panicle; hypanthium about 2 mm. long, densely tomentose; calyx-tube prolonged about 0.5 mm., its lobes very short, triangular; petals obovate, about 3 mm. long; stamens nearly isomorphic; connective briefly prolonged below the thecae and dilated into an oblique cordate organ; stigma capitate.

Widely distributed from southern Mexico and the West Indies to Bolivia and southern Brazil.

CHIRIQUÍ: Boquete, 1200 m., *Davidson 678*. COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1250*. PANAMÁ: in llanos at Chorrera, *White 178*; Isla Taboga, *Woodson, Allen & Seibert 1445*; San José Island, *Erlanson 230, 283*. VERAGUAS: trail between Cañazas and the Cordillera Central, 300–600 m., *Allen 204*.

21. MICONIA PANAMENSIS Gl. in Phytologia 1:341. 1939.

Shrub, the younger stems and petioles very thinly and sparsely stellate-furfuraceous, eventually glabrescent; petioles stout, 3–5 mm. long; leaf-blades firm in texture, ovate-lanceolate or oblong-lanceolate, up to 16 cm. long, a third to two-fifths as wide, long-acuminate, entire, rounded to subcordate at the base, 3-nerved with an additional pair of submarginal nerves, glabrous above, very sparsely stellulate on the primaries beneath; panicle many-flowered with ascending branches, to 15 cm. long; flowers sessile; hypanthium campanulate, 2 mm. long to the torus, very thinly and minutely stellulate; calyx-tube prolonged 0.4 mm., sepals triangular, 0.2 mm. long from the sinuses; exterior teeth minute conic thickenings; petals elliptic, about 2.5 mm. long, white; stamens dimorphic; anthers linear, about 3.5 mm. or 2.7 mm. long, the connective of the larger prolonged below the thecae into a relatively large, cordate organ, the sides deflexed and antrorse, connective of the smaller anthers smaller, prolonged into a narrow dorsal lobe and two small deflexed lateral lobes; stigma capitellate.

Endemic to Panama. Perhaps to be combined with *Miconia chamissois* Naud. which scarcely differs except in its 3-pli-nerved leaves.

BOCAS DEL TORO: vicinity of Macaw Hills, *von Wedel 6, 528*.

22. MICONIA RUBIGINOSA (Bonpl.) DC. Prodr. 3:183. 1828.

Melastoma rubiginosa Humb. & Bonpl. Melast. 109. *t. 47*. 1816.

Shrub to 5 m. tall, the stems, petioles, lower leaf-surface, panicle, and hypanthia tomentose with ferruginous stellate hairs; petioles stout, 5–10 mm. long; leaf-blades firm in texture, oblong, 8–15 cm. long, two-fifths to half as wide, acuminate, entire, broadly rounded to subcordate at base, above sparsely stellate when young, soon glabrescent and somewhat shining, 3-nerved, often with an additional conspicuous pair of marginal nerves; panicle up to 15 cm. long, commonly with superposed branches; hypanthium campanulate, 2–2.5 mm. long to the torus; calyx-tube slightly flaring, prolonged about 0.7 mm.; calyx-lobes obscure, depressed-semicircular; petals obovate, white, about 3 mm. long; stamens dimorphic; anthers linear, about 3 or about 2.5 mm. long, the connective of the larger prolonged dorsally and laterally into a heart-shaped organ oblique to the axis, the lateral lobes antrorse and bearing the filament in the sinus, that of the smaller anthers prolonged into a minute dorsal lobe and two minute deflexed lateral lobes; stigma truncate.

Puerto Rico and Panama to southern Brazil.

COCLÉ: between Agua Dulce and the Río Chico, near sea level, *Pittier 5001*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1285*. PANAMÁ: Isla Toboga, 0–186 m., *Woodson, Allen & Seibert 1442*.

23. MICONIA RUFOSTELLULATA Pittier, in Journ. Wash. Acad. Sci. 13:390. 1923.

Shrub 1.5 m. tall, the younger stems, petioles, panicle, and hypanthia rufous-tomentose with stellate, often stipitate hairs; stems later glabrescent; petioles 5–8 mm. long; leaf-blades lanceolate, up to 8 cm. long, a third to two-fifths as wide, acuminate, entire, rounded at base, 3-nerved, minutely setose above, beneath stellate densely on the primary veins, very sparsely so on the surface; panicles 2–3 cm. long, terminating short bifoliate divaricate branches; flowers 4-merous, subsessile, each (and each node of the panicle) subtended by a short subulate bract; hypanthium cup-shaped, about 1.5 mm. long to the torus; calyx-tube very short, its lobes triangular, acute, 0.7 mm. long from the sinus; exterior teeth adnate almost to the summit of the sepals, thence divergent, subulate, 0.5 mm. long; petals white, obovate-oblong, about 2.5 mm. long; stamens dimorphic; anthers linear, about 2.5 or about 2 mm. long, the connective of the larger broadly dilated below the thecae into a cordate organ, its sides folded around the sides and meeting at the apex of the filament; connective of the small anthers scarcely dilated, prolonged into one minute dorsal and two small lateral lobes; stigma capitate.

Known only from the type collection.

DARIÉN: in clearings around Pinogana, *Pittier 6535*.

V. Section GLOSSOCENTRUM Triana, ex Benth. & Hook. f. in Benth. & Hook. Gen. 1:764. 1867.

Anthers linear or slightly dilated distally, opening by a terminal pore about as wide as the anther; connective variously prolonged or lobed; exterior teeth small or obsolete; flowers usually small.

About 80 species, chiefly in southern Brazil. Only the following species in Panama.

24. MICONIA BOREALIS Gl. in Bull. Torr. Bot. Club 55:118. 1928.

Shrub or small tree, reported to 15 m. tall, the young stems finely stellate-tomentulose, soon glabrescent; petioles 5–15 mm. long; leaf-blades lanceolate to oblong, 8–15 cm. long, a fourth to a third or rarely two-fifths as wide, long-acuminate, entire, rounded at the base, sparsely stellate on both sides when young, soon glabrescent, 3- (rarely 5-) nerved; panicle much branched, often as wide as long, its axes thinly stellate; hypanthium 1–1.5 mm. long, cup-shaped, glabrous or nearly so; calyx-lobes broadly triangular, only 0.2 mm. long; petals obovate-oblong, 2–2.5 mm. long; stamens dimorphic; anthers opening by a wide terminal pore, 2–2.5 or 1.5–2 mm. long, the connective of the larger prolonged into a single flat dorsal lobe wider than the filament, that of the smaller scarcely expanded; style slightly dilated distally to a truncate stigma.

Southern Mexico to Panama; western Cuba.

CANAL ZONE: Barro Colorado Island, *Bangham 486*, *Shattuck 701*; east of Fort Clayton, *Harvey 5123*; near Miraflores Lake, *Harvey 5132*, *White 251*. CHIRIQUÍ: San Félix, *Pittier 5138*. COCLÉ: vicinity of El Valle, *Allen 776*. PANAMÁ: west of Chorrera,

Fig. 92. *Miconia borealis*

Woodson, Allen & Seibert 1677, Paul 499; Isla Taboga, *Woodson, Allen & Seibert 1462*; Bella Vista, *Macbride 2744*; San José Island, *Johnston 32, 1097, 1210, 1394*. VERAGUAS: west of Soná, *Woodson, Allen & Seibert 513*; trail between Cañazas and the foot of the Cordillera Central, 300–600 m., *Allen 161*. PROVINCE UNKNOWN: *Allen 2678*.

VI. Section HARTIGIA (Miq.) Griseb. Fl. Br. W. Ind. 258. 1860.

Anthers short, oblong, about as thick as wide, 2-celled, opening by a minute terminal pore; connective simple; style abruptly bent near the summit.

About 30 species, a few widely distributed, the others chiefly in northwestern South America. The species have been distributed by earlier students in sections Tamonea, Miconia, and Amblyarrhena.*

a. Calyx truncate or merely undulate at the summit, glabrous.
  b. Leaves green beneath, two-fifths to half as long as wide..... 25. M. CILIATA.
  bb. Leaves red-purple beneath, a fourth to a third as long as wide..... 26. M. OINOCHROPHYLLA.
aa. Calyx conspicuously lobed and ciliate..... 27. M. LACERA.

25. MICONIA CILIATA (Rich.) DC. Prodr. 3:179. 1828.

Melastoma ciliata Rich. in Act. Soc. Hist. Nat. Par. 1:109. 1792.

Shrub to 3 m. tall, the younger branches glabrous, or rarely with a few setae at the nodes; petioles slender, 1–3 cm. long, usually setose near the summit on the upper side; leaf-blades firm in texture, oblong, varying toward ovate or obovate, up to 15 cm. long, two-fifths to half as wide, acute or abruptly acuminate, conspicuously ciliate and commonly serrulate, glabrous, 3-nerved; panicle pyramidal, divaricately branched; flowers sessile and secund; hypanthium globose or urceolate, 2–2.5 mm. long; calyx-tube short, erect, truncate; petals about 3 mm. long; stamens isomorphic; anthers stoutly oblong, 1.5 mm. long, 2-celled, the connective simple.

Abundant and widely distributed from southern Mexico and the West Indies to central Brazil and Peru.

CANAL ZONE: Ancón Hill, *Killip 3007*.

26. MICONIA OINOCHROPHYLLA Donn. Sm. in Bot. Gaz. 40:4. 1905.

Glabrous shrub 1–3 m. tall; petioles stout, 1–3 cm. long; leaf-blades red-purple beneath, narrowly oblong to lanceolate, 12–25 cm. long, a fourth to a third as wide, acuminate, entire but ciliate, acute at the base, 3-nerved with a conspicuous pair of submarginal nerves; panicle small, 5–10 cm. long, sparingly branched; flowers sessile, secund, subtended by triangular bracts about 1 mm. long; hypanthium subglobose, 2–2.5 mm. long at anthesis; calyx-tube very short, truncate or nearly so around the summit; petals white to pink, oblong-obovate, 2.5–3 mm.

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* *Stern & Chambers 193* and *187*, both from Piñas Bay, Darién, have recently been referred by Wurdack to *M. robinsoniana* Cogn., a species otherwise endemic to the Galapagos Islands. In the artificial key to the genus *Miconia*, this species would fall next to *M. hondurensis*, differing however in the quadrate branches, denser leaf blade venation, secund flowers, and eglandular stamen connective. The affinities of *M. robinsoniana* are with species 40–45 of Cogniaux' familial monograph, as well as with *M. curvipetiolata* Cogn. & Gl. ex Gl., *M. blakeaefolia* Gl., and *M. transversa* Gl. With such an obvious superfluity of epithets, no phytogeographic speculations concerning the apparent distributional disjunction of *M. robinsoniana* would be valid at present.

long, oblique; stamens isomorphic; anthers slenderly oblong, 1.7 mm. long, 2-celled; connective simple; ovary almost completely inferior, 5-celled; style stout, 2.5 mm. long, abruptly bent near the summit; stigma punctiform.

British Honduras to western Colombia.

COCLÉ: north rim of El Valle de Antón, near Cerro Turrega, 650–700 m., *Allen 174*. COLÓN: summit of Cerro Santa Rita, 360–500 m., *Allen 5098*. PANAMÁ: Cerro Campana, 600–800 m., *Allen 2642*.

Allen 5098 is referred here with some doubt, since it was described by the collector as a vine and the panicle is more widely branched than in typical plants.

27. MICONIA LACERA (Bonpl.) Naud. in Ann. Sci. Nat. Bot. III. 16:152. 1851.

Melastoma lacera Humb. & Bonpl. Melast. 9. *t.* 5. 1816.

Shrub to 4 m. tall, the stems, petioles, and panicle more or less hirsute with purple hairs as much as 10 mm. long; petioles 1–3.5 cm. long; leaf-blades thin, lanceolate to oblong or ovate-lanceolate, up to 15 cm. long and 6 cm. wide, entire or serrulate, acuminate, conspicuously ciliate, obtuse or rounded at base, more or less pilose on both sides, especially on the veins, 3- to 5-nerved; panicle small and compact, commonly 4–8 cm. long, the sessile flowers secund along the branches; hypanthium cup-shaped, about 2 mm. long to the torus, glabrous; calyx-tube prolonged nearly 1 mm.; sepals broadly ovate or nearly semicircular, about 0.5 mm. long from the sinus, conspicuously ciliate with long hairs; exterior teeth triangular, almost completely adnate, the slender free tip about 0.4 mm. long; petals white to pink, oblong-obovate, about 4 mm. long, distinctly retuse; stamens isomorphic; anthers oblong, about 1.5 mm. long, 2-celled, the connective simple; style slender, bent or hooked at the summit, about 3 mm. long.

Abundant in Central America from southern Mexico to Panama; also in the West Indies and Trinidad, and southward to Peru.

BOCAS DEL TORO: Little Bocas, *von Wedel 2492A*; southwest of Bocas at Macaw Hills, *von Wedel 520*; Nances Cay Island, *von Wedel 581*; Shepherd Island, *von Wedel 2726*. CANAL ZONE: Ancón Hill, *Killip 12070, Piper 5566, Seibert 393, Williams 10*; Barro Colorado Island, *Bailey & Bailey 246, 376, Shattuck 317, 1072*; Chagres, *Fendler 33*; vicinity of Gatún Lake, *Chrysler & Roever 4874, Hayes 251, 560*; near Old Fort Lorenzo, *Piper 5992*; Monk[ey?] Hill, *Kuntze s. n.* CHIRIQUÍ: between Río Tinta and Río Tabasará, *Woodson, Allen & Seibert 419*. COCLÉ: vicinity of El Valle, *Allen 755*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1273*; Bismarck, above Penonomé, *Williams 290, 1159*; La Chorrera, *Paul 507*. PANAMÁ: thickets and forests near Arraiján, *Woodson, Allen & Seibert 1352*; Cerro Campana, vicinity of Chica, 600–800 m., *Allen 2651*; Trapiche, Perlas Islands, *Allen 2617*; Isla Taboga, 0–186 m., *Woodson, Allen & Seibert 1437*; San José Island, *Johnston 35, 61, 1110, Erlanson 496*.

VII. Section AMBLYARRHENA Triana, ex Benth. & Hook. f. Gen. Pl. 1:763. 1867.

Anthers oblong or ovoid, thick and stout, as thick as wide, 4-celled, opening by a minute terminal pore; style straight; connective in most species not prolonged below the thecae.

About 130 species, most numerous in the northern Andes mountains from Colombia to Peru.

a. Connective simple, without lobes or appendages; filaments glabrous; stigma small, capitate or truncate.
b. Pubescence thin and sparse, of minute stellate hairs..... 28. M. SCHLIMII.
bb. Pubescence dense, of long simple bristles..... 29. M. COSTARICENSIS.
aa. Connective prolonged as a short truncate lobe over the summit of the glandular filament; stigma peltate, conspicuously lobed..... 30. M. GONIOSTIGMA.

28. MICONIA SCHLIMII Triana, in Trans. Linn. Soc. 28:102. 1871.

Small tree, up to 10 m. tall, the younger stems, petioles, lower leaf-surface, panicle, and hypanthia thinly stellate-tomentose; petioles about 1 cm. long; leaf-blades lanceolate, as much as 17 cm. long but usually much shorter, about two-fifths as wide, acuminate, remotely denticulate, more or less ciliate, acute at the base, 5-pli-nerved, glabrous above; panicles relatively few-flowered, 3–8 cm. long, divaricately branched; flowers 6-merous, sessile at the end of the branchlets; hypanthium broadly campanulate, about 3.5 mm. long (measured on the axis); calyx-tube flaring, about 2 mm. long, truncate or undulate, stellate within and without; exterior teeth minute, conic; petals white, about 10 mm. long, broadly obovate; stamens isomorphic; anthers oblong, blunt, 4-celled, 4.5–5 mm. long, opening by one minute terminal pore; connective simple; ovary 5-celled; style elongate; stigma capitate.

British Honduras to Colombia.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 103*. CHIRIQUÍ: between Concepción and El Volcán, *White 312*; Progreso, *Cooper & Slater 297*. COCLÉ: vicinity of El Valle de Antón, *Allen 1774, 2496*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1241*. DARIÉN: Cana and vicinity, 600–1650 m., *Williams 759*.

29. MICONIA COSTARICENSIS Cogn. in DC. Monogr. Phan. 7:887. 1891.

Shrub to 4 m. tall, the stems, petioles, leaves, inflorescence, and hypanthia densely hirsute with simple red-purple bristles up to 3 mm. long; petioles 5–20 mm. long; leaf-blades ovate-lanceolate to oblong-elliptic, up to 15 cm. long, two-fifths to half as wide, acuminate, obscurely denticulate or crenulate, obtuse to rounded at base, 5-pli-nerved or sometimes merely 5-nerved; panicles 2–5 cm. long, congested; hypanthium cup-shaped, about 2.5 mm. long to the torus; calyx-tube prolonged about 0.5 mm.; calyx-lobes depressed-triangular, about 0.5 mm. long from the sinus; exterior teeth stoutly subulate, hirsute, about 2 mm. long; petals pink, about 3 mm. long; stamens isomorphic; anthers oblong, blunt, 4-celled; stigma truncate.

Costa Rica and Panama.

CHIRIQUÍ: Bajo Chorro, Boquete district, *Davidson 239*; Bajo Mono-Robalo trail, 1500–2100 m., *Allen 4823*.

30. MICONIA GONIOSTIGMA Triana, in Trans. Linn. Soc. 28:124. 1871.

Shrub 1–2 m. tall; all parts of the plant to the hypanthia more or less hirsute or hirsutulous with slender simple hairs seldom more than 1 mm. long; petioles 3–8 mm. long; leaf-blades oblong or elliptic, up to 10 cm. long, two-fifths to half as wide, short-acuminate, entire or denticulate, rounded at the base, 5-nerved or

somewhat 5-pli-nerved; panicle small, sparingly branched and few-flowered; flowers 4-merous or 5-merous, sessile; hypanthium broadly cup-shaped, 2–2.5 mm. long to the torus; calyx glabrous, the tube prolonged 0.4 mm., the lobes semicircular, 0.7 mm. long from the sinus; exterior teeth reduced to minute thickenings; petals subrotund, 3.5–4 mm. long; stamens isomorphic; filaments very broad, glandular on the outer face at the summit; anthers oblong, 4-celled, nearly 2 mm. long, opening by a dorso-terminal pore; connective widened toward the base and projecting as a short truncate body over the summit of the filament; ovary completely inferior; stigma peltate, 2.5 mm. wide, 4 to 5-angled or lobed.

Panama to Ecuador.

DARIÉN: Cana-Cuasi trail, Chepigana district, 600 m., *Terry & Terry 1518*.

VIII. Section CREMANIUM (Don) Triana, ex Benth. & Hook. f. Gen. 1:764. 1867

Anthers oblong to obovate or obovoid, often flattened, commonly widest above the middle, 2-celled or 4-celled, opening by a wide terminal pore through which the septum separating the thecae commonly protrudes; filaments usually permanently geniculate above the middle.

About 150 species, throughout the range of the genus but most numerous in the Andes mountains from Colombia to Bolivia.

a. Anthers 4-celled, the two thecae separated by a radial septum, each theca also divided by a tangential septum; septa extending into the terminal pore and dividing it into four segments..... 31. M. THEAEZANS.
aa. Anthers 2-celled or 4-celled only below the middle, only the radial septum extending into the terminal pore and dividing it into two segments.
b. Connective at base elevated into a dorsal protuberance and prolonged around the base of the thecae into two lateral lobes.
c. Pubescence of simple unbranched hairs..... 32. M. PITTIERI.
cc. Pubescence of stellate hairs..... 33. M. CUSPIDATISSIMA.
bb. Connective at base widened and thickened but not lobed, prolonged distinctly below the thecae and constituting fully half of the minute anther..... 34. M. RUBENS.

31. MICONIA THEAEZANS (Bonpl.) Cogn. in Mart. Fl. Bras. 14^4:419. 1888.

Melastoma theaezans Humb. & Bonpl. Melast. 17. *t.* 9. 1816.

Younger stems more or less sparsely stellate-pubescent, commonly glabrous at maturity; petioles slender, 1–2 cm. long; leaves varying from lanceolate to obovate-oblong, as much as 15 cm. long, commonly smaller, always acuminate and entire, commonly acute but varying to obtuse or even subrotund at base, 3-nerved, rarely 3-pli-nerved, glabrous above, glabrous beneath or retaining more or less stellate pubescence along the veins; panicle 5–15 cm. long, glabrous to stellate-pubescent, widely branched; flowers mostly short-pediceled; hypanthium cup-shaped, glabrous or sparsely stellate, 2–3 mm. long; calyx-tube briefly prolonged, its lobes depressed-semicircular to triangular, 0.3–0.5 mm. long from the sinus; exterior teeth minute conic thickenings; petals white, broadly elliptic to subrotund, commonly somewhat inequilateral and retuse; stamens isomorphic; filaments flat, gradually narrowed to the summit, geniculate above the middle; anthers obovate or obovate-oblong,

flattened tangentially, opening by a wide terminal pore, 4-celled, the septa at right angles to each other and commonly visible through the pore; connective prolonged 0.3–0.5 mm. below the thecae, elevated into a prominent dorsal protuberance and extending below the thecae into two lateral lobes; stigma capitate.

Southern Mexico and the West Indies to southern Brazil and Bolivia. A highly polymorphic species, variable in size and shape of leaves and somewhat in size of flowers but constant in the structure of its anthers; Cogniaux distinguished seventeen varieties.

BOCAS DEL TORO: Buena Vista Camp, Chiriquí trail, 900 m., *Cooper 614*. CHIRIQUÍ: Bajo Chorro, 1800 m., *Davidson 96, 97, 344*; Chiquero, Boquete district, *Davidson 507*; Cerro Horqueta, 1950 m., *von Hagen 2014*; valley of the upper Río Chiriquí Viejo, *White & White 117*. COCLÉ: crest of Cerro Pajita, 1200 m., *Allen 3955*.

32. MICONIA PITTIERI Cogn. in DC. Monogr. Phan. 7:1191. 1891.

Tall shrub, the stems densely retrorse-strigose with brownish hairs; petioles 1–3 cm. long, densely hirsute; leaf-blades ovate-oblong, up to 13 cm. long and about half as wide, short-acuminate, obscurely denticulate, obtuse to subrotund at base, 5-nerved, densely pubescent with simple hairs on both sides; panicle up to 17 cm. long, densely pubescent; pedicels about 1 mm. long; hypanthium cup-shaped, about 2 mm. long to the torus, densely hirsute, the hairs 1–1.5 mm. long; calyx-tube very short, its lobes semicircular, about 0.5 mm. long from the sinus, barely surpassed by the triangular-acuminate exterior teeth; petals white, suborbicular, inequilateral, retuse, 1.6 mm. long; stamens isomorphic; anthers obovoid-oblong, 1.6 mm. long, opening by a wide terminal pore, the connective elevated at base dorsally and prolonged 0.3 mm. below the thecae into two lateral lobes; stigma capitate.

Costa Rica and Panama.

CHIRIQUÍ: vicinity of Bajo Chorro, 1900 m., *Woodson & Schery 630*.

33. MICONIA CUSPIDATISSIMA Pittier, in Journ. Wash. Acad. Sci. 14:449. 1924.

Small tree, reported up to 7 m. tall, the younger parts, petioles, panicle, and hypanthium thinly tomentose with stellate hairs; petioles 1–2 cm. long; leaf-blades oblong to oblong-elliptic, up to 15 cm. long, two-fifths to half as wide, abruptly narrowed above into a caudate tip 1–2 cm. long, entire, obtuse to rounded at base, 3-nerved with an additional pair of marginal nerves (in one specimen 5-plinerved!), glabrous above, stellate-tomentose on the primary nerves beneath, thinly so on the veinlets, glabrous or nearly so on the surface; panicle to 15 cm. long, widely branched; actual pedicels about 1 mm. long; hypanthium cup-shaped, 2–2.5 mm. long to the torus; calyx-tube prolonged about 0.4 mm., the lobes semicircular, about 0.5 mm. long from the sinus, surpassing the triangular adnate exterior teeth; petals white, broadly obovate, 2–3 mm. long; stamens isomorphic; anthers oblong or oblong-obovate, about 2 mm. long; connective dilated toward the base, elevated into a conspicuous dorsal protuberance, and prolonged below the thecae into two deflexed lateral lobes; stigma capitate.

Endemic to Panama, so far as known.

CHIRIQUÍ: Bajo Chorro, Boquete district, 1800 m., *Davidson 387, 715*; between Alto de las Palmas and Cerro de la Horqueta, 2100–2268 m., *Pittier 3224*; upper Caldera watershed, above El Boquete, 1650–1925 m., *Maxon 5654*.

34. MICONIA RUBENS (Sw.) Naud. in Ann. Sci. Nat. Bot. III. 16:169. 1851.

Melastoma rubens Sw. Prodr. Veg. Ind. Occ. 71. 1788.
Topobea micrantha Pittier, in Journ. Wash. Acad. Sci. 14:451. 1924.

Shrub or tree, reported to 18 m. tall, glabrous or essentially so throughout; petioles slender, 1–2 cm. long; leaf-blades thin, elliptic or oblong, varying to obovate-oblong, 3–10 cm. long, a third to half as wide, conspicuously acuminate or caudate to a blunt point, entire, acute, obtuse, or cuneate at base, 3-pli-nerved; panicle small, 3–6 or rarely 10 cm. long, many-flowered; hypanthium cup-shaped, 1.5–2 mm. long to the torus; calyx-tube scarcely prolonged, its lobes semicircular or depressed-triangular, about 0.5 mm. long; exterior teeth varying from a minute thickening to conic, subulate, and 0.5 mm. long; petals white, suborbicular, about 2 mm. long; stamens isomorphic; anthers oblong, about 0.7 mm. long; thecae about 0.4 mm. long, opening by a large ventro-terminal pore; connective conspicuously prolonged below the thecae, more or less dilated, not lobed.

Jamaica, Costa Rica, and Panama.

CHIRIQUÍ: vicinity of Bajo Chorro, 1800–1900 m., *Davidson 181, 334, 390, Woodson & Schery 665*; Bajo Mono–Robalo trail, 1500–2100 m., *Allen 4843*; La Peña Blanca, 1650 m., *von Hagen 2002*; between Alto de las Palmas and Cerro de la Horqueta, 2100–2268 m., *Pittier 3276*; Cerro Horqueta, 1950 m., *von Hagen 2042*.

IX. Section CHAENOPLEURA (Rich. ex DC.) Triana, ex Benth. & Hook. f. Gen. 1:764. 1867.

Anthers oblong to obovate or obovoid, the terminal pore tending to elongate toward the base into clefts.

A section of doubtful validity. Most species may possibly be regarded as members of section CREMANIUM with large ventro-terminal pore. About 50 species have been referred here, chiefly from the West Indies and the Andes mountains. Only the following species in Panama.

35. MICONIA MELANOTRICHA (Triana) Gl. in Brittonia 3:101. 1939.

Clidemia melanotricha Triana, in Trans. Linn. Soc. 28:136. 1871.
Miconia atrosanguinea Cogn. in Engl. Bot. Jahrb. 8:23. 1886.

Shrub to 2 m. tall, the stem densely pubescent or hirsute; petioles 1–3 cm. long, pubescent like the stem; leaf-blades dark green, ovate or ovate-lanceolate, 5–9 cm. long, two-fifths to half as wide, acuminate, rounded or subcordate at base, pubescent on both sides, 5-nerved; panicle trichotomous from the base, broader than long, 1–2 dm. wide, with linear bracts at each node; hypanthium cup-shaped, 3.5–4 mm. long to the torus; sepals oblong, rounded at the summit, about 1.5 mm. long; petals deep red, 6–8 mm. long; stamens isomorphic; filaments 13–18 mm. long; anthers oblong, 3–3.5 mm. long, each theca dehiscing by a longitudinal slit; style 15–25 mm. long; stigma capitate.

Costa Rica, Panama, and western Colombia. The species exists in Panama in two well-marked varieties.

Var. MELANOTRICHA. Stem densely hirsute, the hairs 3–4 mm. long; hairs of the upper leaf-surface 3–4 mm. long, those of the lower surface 1–1.5 mm. long; panicle and hypanthium long-hirsute like the stem.

CHIRIQUÍ: Bajo Chorro, Boquete district, 1800 m., *Davidson 75*; vicinity of Cerro Punta, 1800 m., *Allen 3489*; Bajo Mono–Robalo trail, 1500–2100 m., *Allen 4819*.

Var. **panamensis** Gl. var. nov. Caules densissime pubescentes pilis vix 0.5 mm. longis eis superficie superioris foliorum usque 1 mm. longis inter se vix 0.2 mm. distantibus eis superficie inferioris similiter densis sed tantummodo 0.2 mm. longis.

CHIRIQUÍ: above El Boquete, 1650–1925 m., *Maxon 5653* (Herb. N. Y. Bot. Gard. HOLOTYPE); Bajo Mono–Robalo trail, 1500–2100 m., *Allen 4817*.

SECTION UNKNOWN

36. MICONIA SHATTUCKII Standley, in Contr. Arn. Arb. 5:119. *pl. 16.* 1933.

A shrub or small tree; younger stems, petioles, and panicle thinly pubescent with very short simple hairs; petioles stout, 1–2 cm. long; leaf-blades broadly elliptic, up to 3 dm. long, half to two-thirds as wide, short-acuminate, entire, rounded below to a shallowly cordate base, 7-nerved, glabrous above, sparsely and shortly pubescent beneath; mature inflorescence paniculiform, about 1 dm. long; flowers not seen, but, fide Standley, on pedicels 1–2 mm. long; petals white, 4 mm. long; anthers linear-attenuate, biporose; berries depressed-globose 4.5 mm. diam.

Apparently endemic to Panama.

CANAL ZONE: Barro Colorado Island, *Shattuck* 335.

Terry & Terry 1444, an immature plant from rain-forest on the Cana-Cuasi trail, Darién Province, altitude 600 m., is questionably referred here also.

33. MOURIRI Aubl.

MOURIRI Aubl. Pl. Guian. 1:452. 1775.

Flowers 5-merous. Hypanthium obconic to pyriform or cup-shaped. Sepals commonly coherent in the bud, at anthesis separating nearly or quite to the torus. Petals mostly yellow, ovate to lanceolate, acute or acuminate, often very unsymmetrical. Stamens isomorphic; anthers stout, blunt; thecae much shorter than the anther, opening by a lateral longitudinal cleft on both sides of the anther; connective thickened toward the base, bearing a conspicuous dorsal gland near the middle, often prolonged at base into a short, stout, dorsal spur. Ovary wholly inferior, 1- to 5- celled; stigma punctiform; ovules few in each locule, basal or nearly so. Fruit a berry. Trees or shrubs, usually glabrous, with 1-nerved (in our species) leaves and small axillary cymes.

About 65 species, distributed throughout tropical America, mostly at low elevations and most numerous in Amazonia.

Fig. 93. *Mouriri parvifolia*

a. Leaves sessile, up to 7 cm. long; hypanthium and sepals each 2.5–3 mm. long..... 1. M. PARVIFOLIA.
aa. Leaves short-petioled, 10–25 cm. long; hypanthium and sepals each 5–6 mm. long.
b. Leaf blades papyraceous, the tertiary veins evident; hypanthium brown-tomentulose..... 2. M. BRUNNEICALYX.
bb. Leaf blades coriaceous, the tertiary veins not visible; hypanthium (fide Pittier) glabrous..... 3. M. COMPLETENS.

1. MOURIRI PARVIFOLIA Benth. Bot. Voy. Sulphur 97. *t. 36.* 1844.

Shrub 2–6 m. tall with divaricately branched twigs; leaves sessile, lanceolate or ovate-lanceolate, 3–7 cm. long, a third to half as wide, broadest much below the middle, acute or acuminate, rounded at base; secondary veins obscure or obsolete; flowers few in a fascicle; pedicels 2–4 mm. long, bracteolate near the summit; hypanthium glabrous, 2.5–3 mm. long; sepals narrowly triangular, to 3 mm. long; petals 5–6 mm. long.

Southern Mexico to Bolivia.

CHIRIQUÍ: Cierito, *Cooper & Slater 248.* COCLÉ: mountains beyond Pintada, 400–600 m., *Hunter & Allen 516*; Penonomé and vicinity, *Williams 84, 579.* PANAMÁ: Río Las Lajas, 20 m., *Allen 1609*; lower Río Cabra, 30 m., *Paul 794.*

2. MOURIRI BRUNNEICALYX Standley, ex Woods. & Seibert, in Ann. Mo. Bot. Gard. 24:193. 1937.

Small tree to 7 m. tall; petioles 2–3 mm. long; leaf-blades thin, oblong or barely ovate-oblong, 1–2 dm. long, a third to two-fifths as wide, rounded at the summit to a triangular cusp 5–10 mm. long, broadly rounded at the base; secondary veins prominulous; flowers apparently solitary, on a glabrous peduncle 8 mm. long and a shorter tomentulose pedicel; hypanthium brown-tomentulose, 6 mm. long; sepals triangular-ovate, 5 mm. long; petals at least 8 mm. long.

Endemic to Panama.

PANAMÁ: vicinity of Arenoso, 26–50 m., *Seibert 609.*

3. MOURIRI COMPLETENS (Pittier) Burret, in Notizbl. 11:151. 1931.

Aulacocarpus completens Pittier, in Smiths. Misc. Coll. 63, No. 4:2. 1914.

Tree to 18 m. tall, glabrous; petioles 4–5 mm. long; leaf-blades coriaceous, oblong to ovate-oblong, 14–25 cm. long, 5–11 cm. wide, abruptly short-acuminate at the apex, shortly cordate at the base, the secondary veins subprominulous, the tertiaries not visible; flowers solitary or aggregate on bibracteolate pedicels 12–15 mm. long; hypanthium and sepals each about 5–6 mm. long; petals pink, about 10 mm. long.

Panama and (fide Morley) Colombia.

DARIÉN: El Real de Sta. Maria, *Pittier 6974*; Pinogana, *Pittier 6573.* SAN BLAS: Puerto Obaldía, *Pittier 4310.*

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FLORA OF PANAMA

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Annals
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SYNTHYRIS RANUNCULINA

F. W. WENT

On recent trips to the Charleston Mountains in Southern Nevada I found a plant which I could not possibly identify nor even tentatively assign to a family.

The plant is an herb, growing at about 3,000 m. altitude in moist places; it has a short perennial stem with leaves placed in a rosette. The leaves are round in outline, reniform, with lobed margin, and the whole habit very much resembles *Heuchera rubescens*, which is a common plant at the same altitude in the Charleston area. There are one or two inflorescences per rosette, shorter or slightly longer than the leaves; the peduncle is scapose and carries a short ear-like inflorescence. The flower buds are enclosed between the green bracts, which close tightly into an almost globose structure. Each bract carries an almost sessile flower, which has 2 sepals which are slightly united at the base. The 3 light-blue strap-shaped petals are entirely separate; between the single wider abaxial and the two adaxial petals 2 stamens are inserted, and the ovary is two-celled with one style. The fruit is two-valved, with several seeds per locule, and resembles that of *Veronica*.

This latter fact should have made me look among the Schrophulariaceae, but neither the habit, nor the structure of the inflorescence, nor the flower structure, made this a likely family. Looking through the figures in Abrams' Illustrated Flora of the Pacific States, several species of *Synthyris* were found to have the habit, inflorescence and fruit characteristics of the Charleston Mountains plant, which, it turned out, had been described by Pennell (1933) as *Synthyris ranunculina*. He had seen only fruiting material (the plant occurs in areas covered until June or July with snow, apparently flowers immediately after the snow melts, and toward the end of July or in August, when most collecting is done, has only fruits) and thus had not noticed that the flower structure of this plant differs radically from the other described *Synthyris* species. They are supposed to have 4 calyx lobes, a corolla tube with 4 lobes, 2 stamens and 2 carpels.

Since the Charleston Mountain *Synthyris* differed so extensively in flower characters from the description of this genus, I inspected specimens of all *Synthyris* species described, which I found in the herbarium of the Philadelphia Academy of

Issued January 6, 1959.

Sciences (my thanks are due to Dr. Smith who helped me and who had photographs prepared of all species). It became immediately clear that although *Synthyris ranunculina* differs radically in its flower morphology from the better-known species, there are species with intermediate flower characters, in that *S. stellata* and *S. laciniata* both have only 3 corolla lobes. This poses interesting evolutionary problems, since *S. ranunculina* occurs at the extreme edge of the area of distribution of *Synthyris*, and the nearest species in habit, in flower characters, and in geographical distribution is *S. laciniata* from Southwestern Utah.

To see the evolutionary history of *Synthyris ranunculina* in perspective, I shall briefly summarize Pennell's revision (1933) of the genera *Synthyris* and *Besseya*.

Synthyris and *Besseya* are certainly closely related to *Veronica*, a Scrophulariacea. Typically they have, like *Veronica*, only two stamens, inserted at the base of a short tubular or rotate blue corolla, with a flattened two-valved capsule. The main difference from *Veronica* lies in their vegetative development: on a short upright rootstock the long-petioled leaves are inserted close together, and the flowers are placed in axillary scapose inflorescences. Mostly they occupy moist places in sub-alpine, montane or arctic localities on the North American continent, resembling Saxifragaceae such as *Heuchera* and *Mitella* in habit and habitat.

Synthyris and *Besseya* differ mainly in vegetative characters. The leaves of *Besseya* are cordate and ovate or oblong with palmate venation. They are usually serrate, and the peduncles are more or less densely covered with sessile bract-like leaves. In *Synthyris* the leaves are cordate-reniform with palmate venation, and they are doubly crenate and more or less deeply cleft; the inflorescences are scapose, and the flowers in the ear-like spikes are subtended by bracts exceeding the flower in length.

Besseya occurs in the Rocky Mountain region and further eastward, with one species (*B. rubra*) extending from Montana west to Eastern Washington and Oregon, and two (*B. arizonica* and *B. gooddingii*) extending into N.E. Arizona. It seems doubtful that the latter two species are distinct, and also *B. plantaginea* does not seem specifically separated from these two. In the genus *Besseya*, which forms a natural group of species, an interesting reduction in flower parts occurs: Whereas 7 of the 9 species have a white, or light or dark purple corolla (presumably all with 4 lobes, of which the posterior one is enlarged to a lip), in the two species which extend most northwesterly (*B. rubra* and *B. cinerea*) the corolla is lacking. In the former the calyx is 4-lobed, but in *B. cinerea* this is reduced to 2 lobes.

As far as the flower characters is concerned, *Besseya alpina*, through its purple flower color, and the relatively few bracts on the inflorescence (4–6), seems to be nearest the genus *Synthyris*, and occupies a central position in the distribution pattern of the genus, predominantly in Colorado in the alpine zone of the Central Rocky Mountains, with occurrences in S. Wyoming, N. New Mexico and E. Utah. A group of 5 species, which seem to differ only slightly from each other, mainly in not well-defined quantitative characters (apparent thickness of leaf blade, which in the specimens I have seen seems to be a function of the method of pressing the specimens; more or less elongated leaves; size of flowers, with overlapping ranges),

occurs to the South-West of the range of *Besseya alpina*. Three of these are also alpine, occurring between 3000 and 4000 m. (*B. ritteriana, B. oblongifolia, B. gooddingii*), the other 2 species (*B. plantaginea* and *B. arizonica*) are montane (2000–3000 m.). In flower characters they seem to be very much alike.

From this core of *Besseya* species the other three are clearly separated, both morphologically and in their distribution. *Besseya bullii* has flowers like the preceding species, but has cordate-ovate, palmately veined leaves, which are densely hirsute. It extends from Minnesota and Iowa eastward to Ohio and Michigan, far outside the range of the other species of *Besseya* and *Synthyris*, at low altitudes.

The leaves of *Besseya cinerea* resemble most those of *B. bullii* in hairyness and shape, but it lacks a corolla and its calyx is 2-lobed. This species occurs in montane or alpine localities north of the range of *B. alpina*, from Nebraska and South Dakota to Idaho. The other corolla-less species, *Besseya rubra*, occurs at low altitudes west of the range of *B. cinerea*.

The genus *Synthyris* is more varied and gives us more indications of evolution. In contrast to *Besseya*, which has a very uniform leaf form in all species, leaves in *Synthyris* are of different shape, and there are more variations in flower structure, although reduction does not proceed as far as in *Besseya* where the corolla is lacking in 2 species.

Synthyris reniformis occurs in forests at low altitude in western Oregon, mainly in the coastal ranges, extends into Washington and California; it flowers very early in the year with bright blue campanulate, short 4-lobed corollas. Its leaves are shaped like those of *Viola*, ovate or orbicular-cordate. This species stands apart from the others in the genus, also as regards seed characters (only 2 per locule, brown instead of yellowish in the other species).

The next two species are vegetatively very much alike, with large reniform leaves, both occurring on bluffs or cliffs on the border between Washington and Oregon, S. *schizantha* occurring in the coastal mountains, S. *stellata* along the Columbia river gorge. Their corollas are very different, however. In both the corolla tube is very short, but S. *schizantha* has 4 laciniate lobes like S. *platycarpa* from Idaho, with the lobes slit over more than half their length, and S. *stellata* has 3 entire lobes, the larger abaxial one obovate, the two lateral lobes strap-like. These three species seem to be most closely related to S. *missurica*, which has the widest range of distribution of any *Synthyris* species, occurring at high altitudes throughout Idaho, in adjacent areas in Washington and Oregon, as far as N.E. California. The flowers of this species are typical of *Synthyris*: a short wide corolla tube, with 4 lobes, of which the abaxial one is widest, with the two stamens inserted at its base.

The other species of *Synthyris* are all smaller, and grow in high montane or alpine localities. They can be divided into two distinct groups, one with laciniately once or twice divided leaves, the other with entire reniform leaves, more (S. *canbyi*) or less deeply crenate. The former group consists of a number of very closely related species, each with a very limited distribution range. It seems doubtful to me that some of the species which Pennell distinguishes are really distinct. Thus S. *lanuginosa* from alpine slopes in the Olympic Mountains of Washington and S. *hendersoni* from Central Idaho, both tomentose, seem to be

conspecific, whereas S. *dissecta* and S. *cymopteroides*, both alpine in Montana, both with long corolla tubes and 4 corolla lobes, also seem the same species. The two other species with bipinnate leaves are S. *paysoni* from Wyoming and S. *pinnatifida* from the Wasatch Mountains in Utah, both occurring in alpine habitats. The latter is small, and in size, habit, and shape of inflorescence, very much resembles S. *ranunculina*, but it has a short 4-lobed corolla tube.

The remaining 3 species of *Synthyris* are all small, with reniform leaves. S. *borealis*, villose, occurs in Alaska at timberline. S. *laciniata* is found in Utah near snowbanks in the high country of the Wasatch Mountains. It has a wide, almost campanulate corolla, halfway slit into 3 oblong lobes, sky blue, and has 4 calyx segments. In very similar localities S. *ranunculina* grows in the Charleston Mountains at 3000–3200 m. altitude, near snowbanks. It has lost its corolla tube, but still has 3 narrow strap-like light blue petals, the two stamens inserted next to the sides of the wider abaxial petal. There are only 2 calyx segments.

In figure 1 all the described species of *Synthyris* are depicted through actual photographs of herbarium specimens, all at the same magnification. These photographs are placed on the map of the Western United States in the approximate place of their occurrence, with only the Alaskan S. *borealis* out of place. This figure shows the central position of S. *missurica* and the vegetatively closely similar S. *schizantha*, S. *stellata* and S. *platycarpa* towards the North and North-West. S. *reniformis* is off to the West. The group of species with bipinnate leaves is closely spaced in the North-Eastern and Eastern part of the distribution range, with only S. *lanuginosa* outside this range. And the small species with reniform leaves extend toward the NW, NE and South outside the general range of distribution of the genus. In figure 1 sketches of the flower or of the corolla of several species are also included, with the number of corolla lobes as far as I have determined them.

Synthyris and *Besseya* provide excellent material for an evolutionary analysis. Since most of the species are montane or alpine, occurring in an area with an abundance of extensive mountain ranges and isolated mountains, individual populations have usually been separated for long periods of time, and had time to evolve as separate entities.

Flower structure places these genera close to *Veronica*. This genus of the Scrophulariaceae has about 200 species, and has evolved especially in its vegetative characters. With the exception of 2 (*V. ciliolata* and *V. pulvinaris* from New Zealand with 5 lobes), all species have 4 corolla lobes and 2 stamens, implanted next to the widest lobe. Most species are herbs, but more than one-third are shrubby or almost tree-like (Section *Hebe* from New Zealand). In several species the corolla is tubiform, but in most it is rotate. All have upright stems with opposite leaves, at least on the lower part of the stem. All species grow in temperate regions or are montane, and practically all have the same sky-blue flower color.

The genera most closely related to *Veronica* as indicated by the 2 stamens, the typical capsule, the sky-blue flower color, and the generally rotate corolla, have a very different habit: they all have short perennial caudices with rosettes of basal

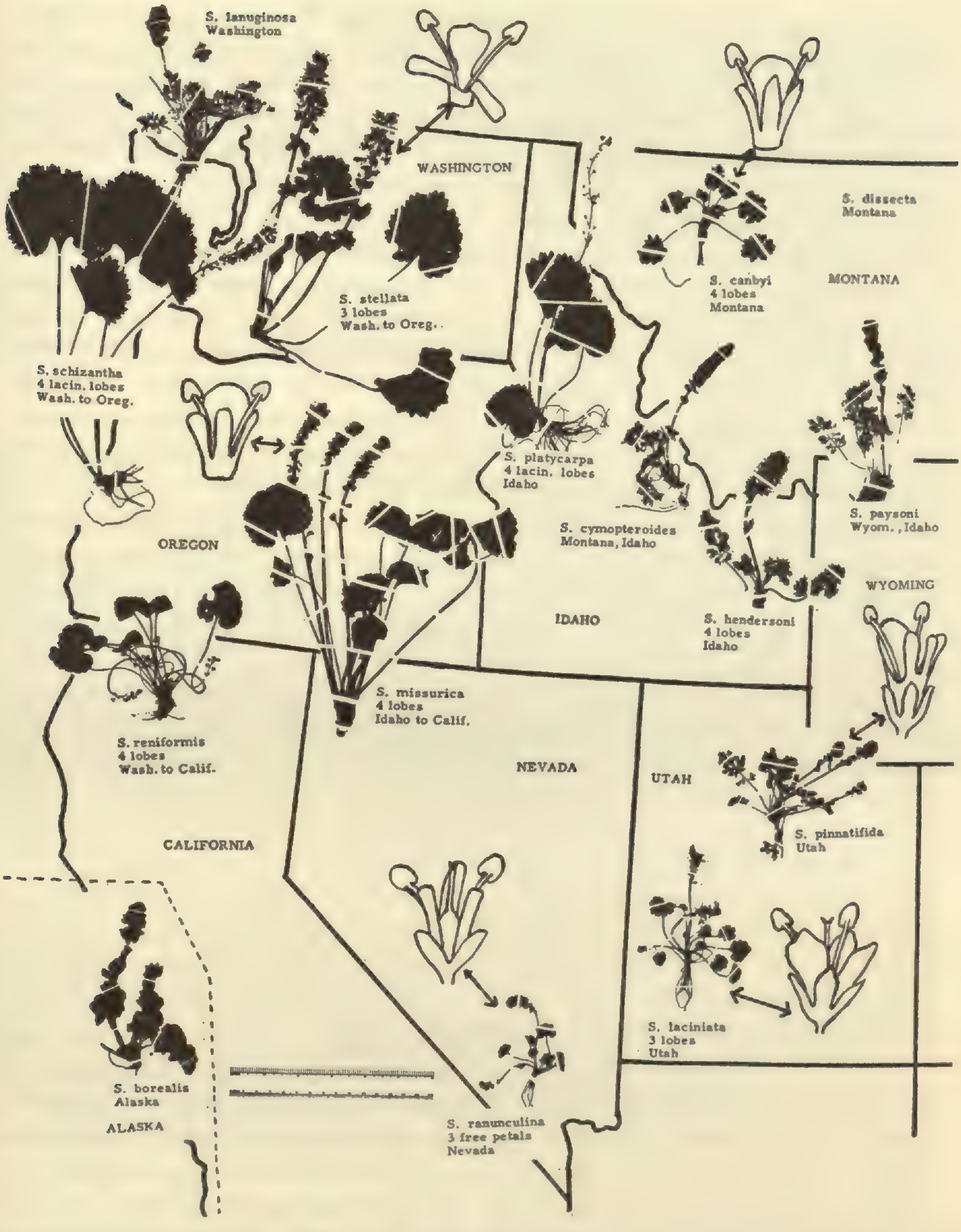

Fig. 1. Distribution and Variation in *Synthyris*

long-petioled leaves. In the Old World the genus *Wulfenia* represents these Veronica-derivatives, all at high altitudes in Carinthia and in the Himalaya; in the New World *Besseya* and *Synthyris* seem to be direct derivatives of *Veronica.* As mentioned earlier, the latter two genera are separated only by vegetative characters: leaf form and bracts on inflorescence. Even if these differences are not admitted for generic differentiation, we still have to recognize that there are two or three lines of differentiation: one of oblong dentate leaves, one of reniform crenate leaves, and one of pinnatifid leaves. In each line there is a tendency for reduction in the flowers: in calyx lobes, corolla lobes and petals in general. In addition, there is a reduction in the number of calyx lobes or sepals. This is of special interest since generic differentiation usually follows flower characters, while specific differences often reside in vegetative characters. But in the case of *Veronica, Wulfenia, Besseya,* and *Synthyris* generic differences are based on vegetative characters, whereas the most significant subsequent evolutionary differentiation of the species of the latter two genera resides in basic flower characters.

It is usually believed that flower characters are only slightly influenced by environment, whereas vegetative characters have a strongly adaptive background. In *Synthyris* and *Besseya*, however, reductions in the flower structure are of specific significance. But in *Besseya* the reductions occur only in the species in the northwestern part of the generic range, whereas in *Synthyris* these reductions are most pronounced in the southern limits of the genus, where *Besseya* does not show flower reductions. Therefore, both arguments tend to strengthen the conclusion that the evolution of these genera in the direction of reductions in the flower structure was *not* a response to the environment nor due to an environmentally controlled selection process, but rather that it was in the nature of an orthogenetic process. In another respect, however, evolution in these genera may have proceeded along lines of selection by the environment. For in both *Besseya* and *Synthyris* the major specific development occurs in montane or alpine habitats, but in both genera species at the northern limit of the genus (with the exception of *Synthyris borealis*) have found habitats near sea level. In both cases the lowland forms are considerably larger than the alpine or montane species.

Culture of *Synthyris ranunculina* in the laboratory has raised the question of how basic are the differences between the genera *Synthyris* and *Besseya.* Normally *Synthyris* has a short ear-like inflorescence, with not more than 2 bracts lower down on the peduncle. But by growing S. *ranunculina* at very low temperatures (14° C in light and 4° C in darkness) the peduncles are very short, and the ear-like part elongates, with bracts over its whole length subtending rudimentary flower buds. Therefore, at the lowest temperature where growth is possible these *Synthyris* inflorescences look superficially as if they belong to *Besseya.*

The condition of evolutionary flux which exists in the flower development of *Synthyris* is reflected in the instability of flower structure in plants grown in the Earhart Laboratory. A plant kept in the shade at 20° day – 14° night temperature

	Number Observed	Green Sepals	Petaloid Sepals	Petals	Stamens	Carpels
Flowers on Plants Growing Wild in Charleston Mountains	Many	2	0	3	2	2
Flowers Developed in Greenhouse	Two Lower Flowers	2	1	3	3	1?
		2	2	1	3	2	2
		1	2	2	3	3	1?
		1	2	2	4	2	2
		1	2	2	4½	2	2

Table I. Number of Flower Parts in Flowers of *Synthyris ranunculina*

had flowers of many different structures. In the sepal series there were only one or two additional ones which were petaloid by being narrow and blue towards the tip. When there were two extra sepals they were adjacent and abaxial. In one case a petal was partially laterally adnate to a petaloid sepal, with a small adventitious petal wedged between them at the point of adnation. The number of petals was unstable, but they were always choripetalous.

Perhaps the most amazing abnormality was the occurrence, in 3 out of 7 flowers, of a third stamen, in the gap between the 2nd and 3rd petal (the 2 normally occurring stamens are implanted at the sides of the adaxial 1st petal). This instability in stamen number is all the more amazing, since in *Veronica* and the other species of *Synthyris* and *Besseya*, the stamen number is completely fixed to 2 and is not known to differ. In 3 of the flowers the ovary seemed reduced to only a simple carpel, but this could not be established. Table I summarizes the flower characteristics, showing that there are at least 6 different flower types in *Synthyris ranunculina*, and that probably all conceivable combinations of 2–4 sepals, 3–4 petals, 2–3 stamens and 1–2 carpels can be found.

Summary. A reexamination of the species of *Synthyris* shows that they can be placed in definite evolutionary lines, which show both morphological and geographic progression. Of special interest are the progressive reduction in flower structure, from 4 corolla lobes towards 3 lobes towards 3 free petals, and from 4 sepals to only 2, with the most reduced forms occurring at the greatest distance from the geographical center of the genus. In *Besseya*, a closely related genus, the reduction of petals is similar, and in two species the corolla has completely disappeared. Again these reduced forms occupy the geographically remotest localities.

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THE NEW WORLD SPECIES OF CYNOMETRA

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Cynometra, a Linnean genus of approximately 75 species is widely distributed throughout the tropics. The New World species have not been studied in detail since Bentham's limited treatment in Martius Flora Brasiliensis in 1876. The present study seems particularly timely in view of the current intensive studies on the African species.

History of the Genus

Linnaeus established the genus *Cynometra* in 1741 (Act. Soc. Upsal. 79) and included it in the first edition of *Species Plantarum* (p. 382. 1753), describing two species from India: *C. cauliflora* and *C. ramiflora*. Vogel described the first New World species: *C. americana* in 1836 (in Linnaea 10:602). In 1840 Bentham (Jour. Bot. 2:74) established the tribes Cynometreae and Amherstieae, including three species of *Cynometra* from tropical America: *C. bauhiniaefolia*, *C. marginata*, and *C. crassifolia*; his subsequent treatment of the genus in Martius Flora Brasiliensis (1876) is classical. The well-known *Cynometra spruceana* was described therein. Four years before Bentham's initial work, Tulasne described two species from French Guiana: *C. hostmanniana* and *C. parvifolia* (Arch. Mus. Nat. Paris 4:181. 1844). With the exception of *C. cubensis* described by de la Sagra (Hist. Cub. 10:233. 1845), all the remaining New World species appeared after 1895.

Recently Léonard (1951) presented an excellent history of the African species. In this same paper he made an important contribution to the taxonomy of the African cynometras when he distributed some 60 species, classically assigned to the genus, among 11 genera. Those species with the stipe of the pistil free in the receptacle-cup were placed in *Cynometra* in limited sense and in *Gilletiodendron*.

Intergeneric Reationship

To establish relationships between *Cynometra* and other genera is a challenging problem. If one considers the question on a regional basis, e.g. New World species only, and accepts the tribe Cynometreae as defined by Bentham as being clearly distinguishable from the allied tribe Amherstieae, the problem seems narrowed considerably. It has been traditional to follow this course in relating the New World cynometras. The Mexican, tropical American, and West Indian species have been related to the New World species of *Copaifera* and to the pantropical genus, *Crudia*; the leaves of these genera are multijugate and the flowers are apetalous, in contrast to *Cynometra* (New World) with unijugate leaves and 5 petals. While such characters are useful in distinguishing the genera, nevertheless, additional significant characters tend to make the problem of relationships of *Cynometra* on a world-wide scale a formidable task.

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Initially the validity of the tribe Cynometreae (as defined by Bentham) is jeopardized by the fact that the most fundamental character utilized by its author: the stipe of the pistil free in the receptacle cup, is not constant for all species of several genera included in the tribe: *Crudia*, *Cynometra* (in wide sense), *Schotia* etc.[1] Léonard, in his recent monograph (1951) of the African cynometras, recognized the inconsistency and divided some sixty African species previously accepted in *Cynometra* among 11 genera. Those species with the stipe of the pistil free in the receptacle-cup were placed in the emended genus *Cynometra* and in *Gilletiodendron* (5 species). In his later treatment (1957) of the African genera of the Cynometreae-Amherstieae complex, he studiously avoided stressing this same character in emending the two tribes under discussion. He elected as his principal distinguishing character the non-envelopment (Cynometreae) or envelopment (Amherstieae) of the floral buds by bracteoles. Unquestionably this was an excellent choice for the African genera; whether it can be applied with success to the non-African Old World genera is an interesting problem. Any discussion of this here would be out of place.

A noteworthy point in considering broad intergeneric relationships involving *Cynometra* is the lack of attention paid to the tropical American tribe Sclerolobieae (nine genera and approximately 60 species). In my opinion it is impossible to define the limits of the tribes Cynometreae and Amherstieae without giving careful consideration to this group.[2] Among its nine genera we find some genera with free central attachment of the stipe (*Sclerolobium*, *Diptychandra* etc.), some with eccentric attachment (*Dicymbe*); two have the bracteoles enveloping the floral buds (*Dicymbe* and *Thylacanthus*), while the remaining seven have bracteoles not enveloping the buds.

A third factor in establishing intergeneric relationships is the obvious relationship of *Cynometra* with the Papuasian genus *Maniltoa*. A superficial glance at herbarium material of *Maniltoa* (unfortunately poorly represented in herbaria) suggests their proximity. The foliage, young strobiliform racemes, and legumes are strikingly similar. The flowers of *Maniltoa* differ in several respects from those of *Cynometra* in the narrow sense: the receptacle-cup is usually more elongate, the stipe is often eccentric in position, and the stamens are numerous. The occasional fusion of the stipe to the wall of the hypanthium suggests affinity with one of the African segregates of *Cynometra*, the genus *Schotia*, also known in the Papuasian-Melanesian region. The need for a critical study of the relationships between *Cynometra* and *Maniltoa* is suggested by A. C. Smith in two recent papers (Sargentia 1:36–38. 1942; and Jour. Arnold Arb. 21:166–171. 1950.).

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[1] The stipe is constantly free in all New World cynometras, and likewise in all African species according to Léonard's concept. While the same is probably true for the Indian and Papuasian-Melanesian species, a thorough study of *Cynometra* and it ally *Maniltoa* in these areas is much needed.

[2] It is my opinion that the tribes Cynometreae, Sclerolobieae, and Amherstieae should be united to form one large tribe Amherstieae. This will be the subject of a separate paper.

In relating the New World cynometras therefore, we must seek affinities with genera traditionally placed in three tribes: Cynometreae, Amherstieae, and Sclerolobieae. The remarkable floral stability of the New World cynometras suggests that this group diverged from the main line evolving in Africa and were able to maintain themselves in a stable fashion in the New World. With the exception of the anomalous *C. fissicuspis* all the New World cynometras seem to resemble more closely (in a limited number of characters) Léonard's "groupe 2." Except for the fact that the extra-African Old World cynometras frequently have multijugate leaves, or occasionally simple leaves, the New World cynometras are structurally quite similar. Bentham in 1840 (in Hook. Lond. Jour. Bot. 100) remarked that "These American Cynometrae are similar to the Asiatic . . . decandrous ones, in the flower and inflorescence."

In viewing the problem of intergeneric relationships on a strictly regional basis, i.e. in the New World, *Cynometra* seems to be more closely related to the genus *Peltogyne* than to *Copaifera* and *Crudia*. The presence of petals, the subimbricate nature of the sepals, as well as the unijugate character of the leaves, suggest this. Their ranges are similar, extending from Mexico to south-eastern Brazil, although *Peltogyne* is absent from the West Indies. *Peltogyne* is readily distinguished from *Cynometra* by its pellucid-punctate leaflets, usually larger flowers, subclavate buds, glandular-punctate and usually densely pubescent sepals, more dilated stigmas, several to numerous ovules, paniculate inflorescences, and the often dehiscent legumes. That some of the species of *Peltogyne* have the stipe of the pistil eccentric is worthy of note.

Morphological Characteristics

STIPULES—these were not found on herbarium specimens, except a few of seedlings deposited in Utrecht. As Britton and Rose (1930) and Amshoff (1939) have indicated, the stipules are filiform and setaceous and measure up to 1 cm. in length.

LEAVES—the leaves of the New World cynometras are consistently unijugate, in this respect differing from several Old World species, e.g. *C. megalocephala* and *C. mannii*. Petioles are obvious in the New World species while petiolules are occasionally measurable, e.g. *C. hostmanniana, C. trinitensis*, and *C. crassifolia*, or are represented by a black glandular area at the base of the lamina. Occasionally a weak filiform extension terminates the petiole proper. While most cynometras have leaflets which are oblong or lanceolate, several divergent forms exist. Of the New World species *C. hostmanniana* alone has consistently equilateral laminas, while those of *C. marginata* var. *acuminata* are occasionally equilateral. Strongly inequilateral leaflets, on the other hand, characterize several species: *C. cubensis*, *C. oaxacana*, and *C. duckei*. In most species the blades are obviously acuminate, with a few: *C. spruceana* var. *phaselocarpa*, *C. microflora*, and *C. duckei*, with very obtuse leaflets. In two collections (*Purpus 7383*, the type of *C. oaxacana*, and *Spruce s. n.*, K. type of *C. spruceana* var. *procera*) the leaves were found to

vary widely in texture and venation, some being thin and obviously reticulate, while others of the same collection were found to be thicker and smoother, with the principal veins immersed or evanescent. This is disconcerting inasmuch as considerable emphasis is placed on these characters in segregating the species.

The leaflets of the New World cynometras are not glandular-punctate although Pittier, the author of the confusing *C. fissicuspis*, assigns this character to the leaflets (cf. my discussion p. 342, this paper); Tulasne, too, in his original description of *C. parvifolia*, characterizes the blades as "interdum pellucido-punctatis." In the present study considerable attention was paid to the rugulose nature of the blade (under mag.) of some species as well as the papillate nature of the leaflets of other species. These are not completely reliable diagnostic characters at the species level inasmuch as the blades of some collections of *C. marginata* may be rugulose while others on the same twig are papillate. In general, however, those leaves with obviously reticulate leaflets are invariably papillate, and conversely those with immersed or plane secondary veins are rugulose. Among the New World cynometras only the new species, *C. duckei*, has the leaflets neither papillate nor rugulose above.

While petioles are invariably pubescent, the leaflets are rarely so (*C. bauhiniaefolia* var. *macrophylla*, some collections of *C. cubensis*, *C. crassifolia*, *C. longicuspis*). In most cases the hairs are confined to the mid-veins or may extend to the secondary veins, although the type of *C. bauhiniaefolia* var. *macrophylla* has completely pubescent blades.

INFLORESCENCES—two features of the inflorescence are useful for diagnostic purposes: the relative length of the rachis, and secondly the numbers of flowers present. Scarcely measurable rachises are occasionally densely flowered, e.g. *C. schottiana*. The usually elongate pedicels tend to persist on the rachis until the petals fall away. Initially the rachis emerges from a gemmiform cluster of concave and imbricate bracts, which are often persistent. Such collections of bracts, frequently described as strobiliform, are characteristic of other genera of the tribe Cynometreae: *Guibourtia*, *Copaifera*, etc. Unlike the bracteoles the bracts are stiffer, more crassate, and more uniformly pubescent (except in *C. hostmanniana*).

The bracteoles are oblong, carinate (doubtfully so in section NUMMUS), and paired, being attached at the base of the pedicels in most species. In three species: *C. spruceana*, *C. longifolia*, and *C. stenopetala* these appear to be located along the middle third of the pedicel. Bracteoles were not observed in *C. americana*, *C. cubensis*, *C. portoricensis*, *C. schottiana*, and *C. crassifolia*. Since bracteoles are soon deciduous it is possible that they may be present on immature inflorescences of these species.

The pedicels of the flowers are slender in all species, being better described as filiform in *C. spruceana*, *C. cuneata*, and *C. longiflora*. The reduction or absence of hairs on the floriferous pedicels of *C. hostmanniana* and *C. microflora* is noteworthy.

FLORAL STRUCTURE—the receptacle-cup or hypanthium, while small, is obvious as in most genera of the Amherstieae-Cynometreae complex, with the perianth and the androecium borne on the margin of same. The external pubescence of the hypanthium and the thickness of the wall are of little importance as interspecific characters in the New World cynometras.

The sepals are always somewhat unequal and reflexed at anthesis though not markedly so in *C. fissicuspis*. Although varying little in puberulence, venation etc., they are uniformly scarious in texture except in *C. americana*. These number 4 or 5, although reduction to three per flower is not uncommon. The flowers of *C. oaxacana* and *C. marginata* are occasionally bisepalous. The sepals are puberulent on the outside, often sparsely so; occasionally sepals of *C. oaxacana* and *C. spruceana* may be glabrous.

The petals of the New World cynometras show little variation in shape and venation, and are regularly thin except in *C. americana*. They are glabrous, except that those of *C. bauhiniaefolia* var. *macrophylla* and *C. parvifolia* may occasionally have a few apical or marginal hairs. In *C. portoricensis* and *C. stenopetala* the petals are of about the same length as the sepals.

The stamens are constantly 10 and glabrous. No staminodia were found in the numerous flowers dissected; the filaments are consistently slender, unequal in length, and united very briefly at the base. The anthers are always small, not exceeding 1.5 mm. in length, and versatile. In general the androecium furnishes no diagnostic characters of importance.

Equally disappointing in furnishing diagnostic characters is the pistil. In the key to species only three ovarian characters are utilized: the few hairs in *C. trinitensis*, the appressed sericeous condition of *C. cuneata*, and the glabrous condition of *C. fissicuspis*.

FRUITS—the fact that only about 10% of the herbarium material examined bore fruit presented considerable difficulty in interpreting the material. Despite this the legumes provide several important characters: size, thickness of the wall of the valves, and surface modification of the valves. Most ripe fruits are glabrous although the valves of *C. bauhiniaefolia* are velutinous while those of *C. spruceana*, and occasionally *C. portoricensis*, are puberulent. Whether this is a consistent character in the first two species is questionable. The pods are usually oblong, and turgid, and only occasionally are compressed, e.g. in *C. portoricensis* and *C. hondurensis*. They are regularly indehiscent. Amshoff states that *C. hostmanniana* has "infertile pods . . . at last splitting into 2, showing no cavity at all." A collection of *C. hostmanniana* (*Froes 25771*) has pods which seem to have split open irregularly on drying. This same irregular dehiscence was noted on a collection (*Elmer 12954*) of *C. bijuga* from the Philippine Islands.

The pericarp in dried fruit is usually very spongy in appearance on the broken surface and light in weight. The wall may range from 0.5 mm. (*C. parvifolia*) to 3 mm. (*C. retusa*) in thickness. This is probably an excellent diagnostic character, the limited fruiting material however, makes it difficult to evaluate. The pods

are of 4 types with reference to the character of the surface: relatively smooth with minute granulations or excresences (*C. hemitomophylla*, *C. portoricensis*); obviously rugate and bearing some resemblance to the convolutions of a mammalian cerebrum (e.g. *C. bauhiniaefolia*); tuberculate (e.g. *C. duckei*); smooth, lustrous and vaguely reticulate (one species, *C. fissicuspis*). Rugate and tuberculate types are themselves often minutely granulose.

The fruits of *C. fissicuspis* are noteworthy inasmuch as they bear some resemblance to the pods of several African species placed by Léonard in his "Groupe 3." On the other hand these African species diverge markedly in having several pairs of leaflets, five sepals, bracteoles often articulate at the summit of the pedicels, and dehiscent fruits. The fruits of the taxa of "Groupe 3" are apparently more strongly reticulate and are not round but oblong in shape.

An examination of the legumes of the non-African Old World species indicates that they are regularly indehiscent and in general are either distinctly rugate or tuberculate, some being deeply incised on the surface.

Interspecific Relationships and Geographic Distribution

As suggested previously the New World cynometras are closely knit morphologically with surprisingly few characters of diagnostic importance. In view of the paucity of useful floral characters and the few legumes available for study, the foliage assumes added importance. Among the numerous species placed in section COMATOVARIA, those confined to Mexico and Central America tend to have considerably larger leaflets and to a lesser degree more compressed racemes than their South American allies. The fact that approximately one-half of the New World cynometras are found in Amazonia, with four species of the group: *C. longifolia*, *C. longicuspis*, *C. stenopetala* and *C. duckei*, restricted to the Brazilian states of Pará and Amazonas, suggests that Amazonian Brazil is the center of geographical distribution for the New World species.

Three new sections are proposed herein for the New World cynometras: COMATOVARIA, GUIANA and NUMMUS.[3] A view of Léonard's 3 "groupes", proposed for the African species of the genus, indicates that the 3 sections proposed for the New World species bear little relationship with those tentatively proposed for Africa.

Economic Importance

Although the cynometras are trees, the New World species are apparently of little use commercially. In discussing *C. sphaerocarpa*, Pittier, the author of the species (in *Enum. Plantas Usuales* 184. 1926) states that the wood is excellent for construction. In the same discussion he adds that the seeds "son estomáquicas y

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[3] NUMMUS (L. = coin) refers to the fancied resemblance of the legumes of *C. fissicuspis* to a coin. COMATOVARIA (comatus L. = densely hairy) refers to the fact that the ovaries of all species are conspicuously hairy.

antipalúdicas." No oleoresins of commercial value have been reported for the New World cynometras.[4]

Standley in his *Flora of Lancetilla Valley* (Honduras), in Field Mus. Nat. Hist. 10:219. 1931, states that the wood of *C. retusa* is used for charcoal.

Record and Hess (*Timbers of the New World*, p. 252, 1943) list several common names which I have not seen on the labels of herbarium material: "courbaril (Haiti); bruta de danto (Hond.); . . . herairo (Peru), guarabu amarello, iauaranami, jutahy-rana, pororoca (Brazil), ingá-puita (Arg.)."

Acknowledgements

I wish to express my appreciation to the Missouri Botanical Garden for the use of its herbarium and library facilities. I wish also to thank the directors of the institutions listed below who were kind enough to allow me to examine herbarium material of *Cynometra*. For purposes of citation a letter designating the particular institution is used:

Arnold Arboretum, Harvard University, Cambridge, Mass. (A)
Jardin Botanique de l'Etat, Bruxelles, Belgium. (B).
Chicago Natural History Museum, Chicago, Ill. (F).
Conservatoire et Jardins Botaniques, Geneva, Switzerland. (G).
Department of Agriculture, Georgetown, British Guiana. (BRG).
Royal Botanic Garden, Kew, England. (K).
Herbarium, Department of Botany, University of California, Los Angeles, Calif. (LA).
Missouri Botanical Garden, St. Louis, Mo. (MO).
New York Botanical Garden, New York, N. Y. (NY).
Museum National d'Histoire Naturelle, Laboratoire de Phanérogamie, Paris, France. (P).
Seccao de Botanica Sistematica, Jardin Botanico do Rio de Janeiro, Rio de Janeiro, Brazil. (R).
Botanische Museum en Herbarium van de Rijksuniversiteit te Utrecht, Utrecht, Netherlands. (U).
División de Botánica, Ministerio de Agricultura y Cría, Caracas, Venezuela. (V).
Naturhistorisches Museum, Botanische Abteilung, Wien, Austria. (W).
Yale University School of Forestry, New Haven, Conn. (Y).

Taxonomy

Cynometra L. Act. Soc. Upsal. 79. 1741 and Sp. Pl. ed. 1. 382. 1753.

Trees or shrubs. Stipules filiform, soon deciduous. Leaves simple or pinnately compound (exclusively unijugate in New World), the blades equilateral to inequilateral, usually acuminate, emarginate, the venation pinnately reticulate, the margin entire. Racemes or panicles. Racemes usually strobiliform in young state, usually one to several per axil, the bracts scarious or membranaceous, the bracteoles paired, not enveloping the young bud, deciduous. Flowers obviously pedicellate, occasionally articulate. Receptacle cup short, usually without a thickened disc. Sepals usually 4–5, but occasionally 2 or 3, free, imbricate, unequal, usually reflexed. Petals 5, usually equal in length; stamens 10 (8–12 by exception)

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[4] True copal is obtained from a number of trees of the Leguminosae. *C. sessiliflora* Harms of the Old World is the only member of the genus known to yield copal.

glabrous, the anthers small, versatile, the filaments slender, usually very briefly united at base; stipe of pistil free in receptacle cup, the ovary usually hairy, the style slender, the stigma capitate, the ovules 1–2 (3 or 4 by exception). Legumes dehiscent or indehiscent, usually rugate or tuberculate on surface, occasionally smooth, the seeds 1–2.

Type species: *C. cauliflora* L.

Key to Sections of New World Cynometras*

a. Ovaries hairy; fruit not reticulate.
  b. Leaflets obviously inequilateral; pedicels of flowers pubescent; larger bracts 2–5 mm. long; bracteoles present (some species uncertain) but soon deciduous.....Section 1. COMATOVARIA Dwyer
  bb. Leaflets regularly equilateral; pedicels of flowers glabrous to scarcely pubescent; bracts about 1 mm. long, glabrous; bracteoles absent.....Section 2. GUIANA Dwyer (Species 21. *C. hostmanniana*)

aa. Ovary glabrous; fruit reticulate.....Section 3. NUMMUS Dwyer (Species 22. *C. fissicuspis*)

Section 1—COMATOVARIA Dwyer

a. Perianth obviously carnose.....Subsection A—COMATOVARIA
  1. *C. americana.*
aa. Perianth non-carnose.....Subsection B—TENUIFLORA Dwyer
  b. Leaflets more than 2 cm. long (except some leaflets of *C. cubensis*, *C. microflora* and *C. duckei*), not narrow-lanceolate.
    c. Lowermost veins (if seen) well-spaced along costa and not spreading flabellately; legumes not velutinous (except possibly *C. spruceana*).
      d. Secondary veins visible above.
        e. Leaflets (1–)2–4 cm. long, obtuse or only vaguely acuminate. West Indies.
          f. Leaflets obliquely oblong-rotund or obliquely oblong, (1–)2–2.5 cm. long, obtuse at apex; petals 6–8 mm. long, obviously longer than sepals; legumes plump, papillate and scrobiculate.....2. *C. cubensis.*
          ff. Leaflets narrow-oblong, 5.5 cm. long, obtuse or only vaguely acuminate at apex; petals up to 3.5 mm. long, as short or shorter than sepals; legumes compressed to turgid and with dark brown excrescences.....3. *C. portoricensis.*
        ee. Leaflets 4–14 cm. long, acuminate. Mexico and tropical America.
          g. Largest leaflets 8–14 cm. long; legumes 2–4 cm. long, crustulose. Central America. (*C. trinitensis*?).
            h. Leaflets coriaceous; legumes turgid.
              i. Hairs densely disposed on valves of ovary.
                j. Leaflets narrow-oblong or oblong-lanceolate, 4–11 cm. long, 2–3.5 cm. wide, the secondary veins prominulous or immersed; fruit nutmeg-like in shape, the pericarp up to 3 mm. thick. Mexico, Guatemala, Honduras, and British Honduras.....4. *C. retusa.*

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* In order to publish validly the new section and subsections the following latin descriptions are appended:

COMATOVARIA Dwyer, sect. nov.: Folia inaequilateralia. Pedicelli florum dense puberuli. Legumina non reticulata. Species typica: *C. americana* Vogel.

Subsect. COMATOVARIA. Sepala petalaque carnosa. TENUIFLORA Dwyer, subsect. nov. Sepala petalaque tenuia. Species typica *C. bauhiniaefolia.*

GUIANA Dwyer, sect. nov.: Folia aequilateralia. Pedicelli florum vix puberuli vel glabri. Legumina non reticulata. Species typica: *C. hostmanniana.*

NUMMUS Dwyer, sect. nov. Ovaria glabra. Legumina reticulata laevia compressa. Species typica: *C. fissicuspis.*

jj. Leaflets elliptic, 9–14 cm. long, 3–5 cm. wide, the secondary veins prominulous; fruit turgid but not rotund, the pericarp up to 2 mm. thick. Costa Rica.....5. *C. hemitomophylla.*
ii. Hairs sparsely scattered on valves of ovary.....6. *C. trinitensis.*
hh. Leaflets stiff-papyraceous to stiff-chartaceous.
k. Rachises 0.8–2 cm. long; pedicels 0.5–0.6 cm. long.....7. *C. hondurensis.*
kk. Rachises 0.2–0.3 cm. long; pedicels up to 1.3 cm. long.....8. *C. schottiana.*
gg. Largest leaflets 4–9 cm. long (except *C. cuneata* and *C. longifolia* often longer); legumes 1–2 cm. long (except *C. longicuspis* are longer), crustulose or rugulose. Mexico and tropical South America.
l. Leaflets minutely papillate (sub. mag.) (except *C. oaxacana*); costa prominulous; rachises of inflorescences 0.2–2 cm. long; pedicels of flowers up to 1.2 cm. long (except *C. marginata* var. *acuminata* up to 1.8 cm. long and *C. cuneata* up to 2 cm. long), the bracteoles attached basally.
m. Petioles 0.2–0.8 cm. long; rachises of inflorescences 3–10 flowered, 0.2–2 cm. long; petals 2.8–5.2 cm. long; hairs of ovary not uniformly appressed.
n. Leaflets stiff-chartaceous to thin-coriaceous; sepals 2.5–4.5 mm. long; petals 3–5 mm. long.
o. Leaflets oblong, sublanceolate or narrow-elliptic, 4–7 cm. long; 1.5–3 cm. wide, acuminate; sepals 3–4; wall of pericarp up to 1 mm. thick. Surinam, Venezuela, Brazil, British Guiana.....9. *C. marginata.*
oo. Leaflets ovate-oblong to ovate-sublanceolate, 3.5–8 cm. long, 1.5–5 cm. wide, obtuse; sepals frequently only 2; wall of pericarp up to 0.5 mm. thick. Mexico.....10. *C. oaxacana.*
nn. Leaflets coriaceous; sepals 2.0–3.5 mm. long; petals 2.3–5.2 mm. long.
p. Leaflets petiolulate for 1 mm.; lowermost veins of lamina sharply ascending; sepals 2.5–3.5 mm. long; petals 4.5–5.2 mm. long, 1.2–1.6 mm. wide.....11. *C. crassifolia.*
pp. Leaflets not obviously petiolulate; lowermost veins ascending at about the same angle as upper veins; sepals 2–3 mm. long; petals 2.3–2.8 mm. long, 0.5–1 mm. wide.....12. *C. stenopetala.*
mm. Petioles 0.5–1.8 cm. long; rachises of inflorescences 10–20 flowered, up to 2 cm. long; hairs of pistil uniformly appressed.....13. *C. cuneata.*
ll. Leaflets rugulose (sub. mag.); costa usually plane above; secondary veins plane or immersed above; rachises of inflorescences 0.2–6 cm. long; pedicels of flowers 1–2 cm. long, the bracteoles (or scars) below middle but not strictly basal.
q. Rachises of inflorescences 0.2–2 cm. long; majority of bracts deciduous at anthesis; flowers up to 15 per rachis.
r. Legume obviously rugose.....14. *C. spruceana.*
rr. Legume rough but not rugose.....15. *C. longicuspis.*
qq. Rachises of inflorescences up to 6 cm. long; majority of bracts persistent at anthesis; flowers 30–50 per rachis.....16. *C. longifolia.*
dd. Leaflets with secondary veins scarcely visible above (sub. mag.), non-papillate or rugulose above; fruit tuberculate.....17. *C. duckei.*
cc. Lowermost pair of veins on wider side flabellately disposed and usually of same size basally as costa; legumes rugose and velutinous.
s. Leaflets obliquely ovate-oblong to ovate-lanceolate 1–4 cm. long, 0.5–2 cm. wide; pedicels pubescent.....18. *C. bauhiniaefolia.*
ss. Leaflets ovate-rotund or oval-lanceolate, up to 2 cm. long, up to 1.5 cm. wide; pedicels glabrous.....19. *C. microflora.*
bb. Leaflets less than 2 cm. long, narrow-lanceolate.....20. *C. parvifolia.*

1. CYNOMETRA AMERICANA Vogel, in Linnaea 10:602. 1836.

Small tree. Branchlets glabrous, ultimately lustrous and rubescent, the lenticels pustulate. Petioles 0.4–1 cm. long, glabrous. Leaflets oblique-lanceolate, oblique-oblong or ovate-oblong, occasionally subtrapeziform, 5–14 cm. long, 2.5–5 cm. wide, tapering cuneately into an acumen, ultimately obtuse and retuse, the wider side tapering narrowly or frequently subauriculate at base, the costa prominulous above, the secondary veins prominulous above, more prominulous beneath, the lamina thin-coriaceous, rugulose above, papillate beneath,

lustrous, inequilateral, glabrous. Bracts oblong or oblong-rotund, up to 2.5 mm. long, up to 2 mm. wide, puberulent dorsally and marginally. Bracteoles somewhat concave, oblong, up to 2 mm. long. Racemes 1–3 per axil, the rachises 0.1–0.5 cm. long, puberulent, the flowers about 10 per rachis; sepals 3–4, oblong-rotund, ovate-rotund to rectangular, 3.5–4.5 mm. long, 2–3.5 mm. wide, carnose, glabrous; petals obovate-oblong to oblong, 4.2–5 mm. long, 2–3.5 mm. wide, spatulate or obtuse at base, carnose; filaments 4.5–7 mm. long, carnose; anthers subrotund, 0.8–1 mm. long; ovaries oblong to subrotund, 2–3.5 mm. long, carnose, densely pubescent, the style 2.5–3.5 mm. long, carnose; legumes (here immature?) oblique-oblong, up to 1.5 cm. long, compressed, marcescent, finely velutinous.

HAITI: Les Atricots, *Eyerdam 310* (A, NY, US); Petionville, *Ekman H2343* (A, US); Port de Paix, *Ekman H4563* (A, US); vicinity of Jean Rabel, River Cote de Fer, *Leonard & Leonard 12748* (US).

C. americana, endemic to Haiti has several obvious distinguishing characteristics: the carnose perianth parts and the relatively large leaflets which are strikingly bicolor and which usually taper cuneately into an acumen. The carnose character of the perianth is not encountered in any other New World species, and is the chief reason for placing *C. americana* in a separate subsection.

2. CYNOMETRA CUBENSIS Rich. in de la Sagra Hist. Cuba 10:233. 1845. (T.: *de la Sagra s. n.*!).

Shrub or small tree. Branchlets glabrous, stiff, the lenticels obvious. Petioles 0.2–0.4 cm. long, glabrous to puberulent. Leaflets obliquely oblong-rotund or oblique-oblong, occasionally subtrapeziform, 0.8–2.5 cm. long, almost as wide as long, very inequilateral, the narrow side often 1/6th the width of the wide side, reticulose especially below, obtuse at apex, ultimately retuse, obtuse at base on wide side, vaguely papillate (under mag.), the costa prominulous above but evanescing apically, occasionally pubescent, the secondary veins about 7, subprominulous to subimmersed, the lamina coriaceous to thin-coriaceous, smooth and lustrous above, obviously inequilateral, glabrous. Bracts oblong-rotund to narrow-oblong up to 3 mm. long, ferrugineo-puberulent dorsally; bracteoles not seen. Racemes apparently one per axil, the rachises 0.5–1 cm. long, ferrugineo-puberulent, the flowers 6–10 per rachis, the pedicels 0.6–1.2 cm. long, about 0.6 mm. wide, ferrugineo-puberulent. Sepals 4–5, oblong to oblong-rotund, 4–6 mm. long, 1.5–3.2 mm. wide, pubescent basally within; petals lanceolate, 6–8 mm. long, 2–2.6 mm. wide, acute at apex, spatulate at base; filaments 7–11 mm. long, the anthers oblong, about 0.8 mm. long; ovary obliquely-oblong, about 3 mm. long, 1.8 mm. wide, densely pubescent, the style about 5 mm. long, subcrassate proximally, obviously eccentric. Legume obliquely elliptic, up to 3 cm. long, plump, granulose or crustulose, the wall of the pericarp up to 0.8 mm. thick.

CUBA: without locality, *Wright 2386* (G, US); Pinar del Río: Sierra de los Organos, *Ekman 12684* (A, G), *12978* (A, US); Morillo, *Ekman 17375* (A, G, NY); Buenavista, Cayajabos, *Léon 13552* (NY), *13805* (NY); Río Francisco, *Ekman 18204* (A, NY); Valenzuela (?), *de la Sagra s. n.* (P); Havana, *de la Sagra 307* (A, G).

C. cubensis is closely allied to the only other West Indian species, *C. portoricensis*.[5] Both have unusually small obtuse to vaguely acuminate leaflets. The Cuban species has more or less orbicular leaflets in contrast to the narrow-oblong blades of *C. portoricensis*. The flowers of *C. cubensis* are much larger and the rachis of the racemes more elongate. The fruits are more turgid with the crustulose excrescences less prominent than in its ally.

The de la Sagra collection in Paris is probably the type despite the fact that the locality on the label (Valenzuela) does not agree with the cited type locality: "Vuelta de Abajo." It is an excellent match for the illustration (plate 41) in de la Sagra's *Hist. Cuba* 1845.

In several dissections the sepals proved to be puberulent at the base within. This was not observed in the calyx of any other New World *Cynometra*. The type description indicates that "filaments (stamens) . . . subvillosa". This was not observed and is probably an error inasmuch as the filaments of all cynometras are glabrous. The common name of *C. cubensis* is "Pico de Gallo."

3. Cynometra portoricensis Krug and Urban, in Symb. Ant. 1:312. 1899. (T.: *Sintenis 5600*!).

Small tree. Branchlets somewhat smooth, rimose, glabrous, the lenticels often papillate. Petioles 0.2–0.3 cm. long, puberulent. Leaflets narrow-oblong to oblong or lanceolate, 1.6 cm. long, 0.5–2.6 cm. wide, obtuse to vaguely obtuse-acuminate at apex, obtuse to subauriculate at base on wide side, the costa prominulous above but evanescing apically, the secondary veins ± 10, often plane or subimmersed above, the lamina reticulate especially below, not papillate above, vaguely papillate below, coriaceous, lustrous, inequilateral to equilateral, glabrous. Bracts ovate-rotund, about 2 mm. long; bracteoles not seen. Racemes apparently solitary in the axils, the rachises up to 0.5 cm. long, puberulent, the flowers few per rachis, the pedicels 0.4–0.6 cm. long, densely pubescent; sepals 4–5, oblong, about 5 mm. long; petals oblong, 2.5–3 mm. long, obtuse to subspatulate at base, white in vivo; filaments up to 5 mm. long, the anthers oblong, 0.8–1 mm. long; ovaries densely pubescent, the style about as long as ovary. Legume oblong, 2.5–3 cm. long, 1.5–1.8 cm. wide, compressed or turgid, the surface with crustaceous excrescences, velutinous or glabrous, the wall of pericarp about 1 mm. thick.

Puerto Rico: near Rincón "ad Quebrada el Salto", *Sintenis 5600* (A, B, G, P, U, W); Barrio Rosario near Mayagüez, *Cowles s. n.* (US); near Arecibo, *Cowles 347* (NY), *2048* (NY); Rosario, San Germán (NY); Vega Alta, *Gleason & Cook A-21*, *A-136* (NY).

Dominican Republic: Barahona, *Fuertes 1452* (NY, P); Santo Domingo City, Río Oxuma, *Ekman 12511* (A, US); Com. Palmar, *J. Jiménez 2495* (US); Lopez, Prov. Santiago, *Jiménez 458* (US).

The description of the flowers is of particular interest inasmuch as Krug & Urban did not include this in their original diagnosis. Noteworthy is the fact that

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[5] This statement is based on the assumption that *C. trinitensis* is not a West Indian species.

the petals are shorter or barely as long as the sepals. Krug and Urban originally described the legumes as "postremo dehiscentia." This seems questionable especially in view of the fact that the herbarium material lacks dehiscent fruits. As indicated in the introduction, legumes with regular dehiscence are not found in the New World cynometras.

4. CYNOMETRA RETUSA Britton and Rose, in Trop. Woods 7:5. 1926. (T.: *Record 8832*!).

Small tree. Branchlets smooth, glabrous to puberulent, the lenticels often scattered-punctate. Petioles 0.4–0.7 cm. long, glabrous to puberulent. Leaflets narrow-oblong to lance-oblong, 4–11 cm. long, 1.2–4 cm. wide, usually attenuate-acuminate at apex, often falcately so, obtuse or cuneate at base on wide side, the costa prominulous above, the secondary veins ± 10, prominulous or immersed, the lamina vaguely to obviously rugulose or papillate above, papillate beneath, thin-coriaceous, lustrous above, inequilateral, glabrous. Bracts disposed as a lanceolate cluster in bud, up to 2 cm. long, ovate to ovate-lanceolate, 3.5–5 mm. long, densely puberulent dorsally; bracteoles oblong, about 2 mm. long, ciliate on back, soon deciduous. Racemes apparently solitary in the axils, the rachises 0.4–0.6 cm. long, puberulent, the flowers 10–20 per rachis, the pedicels slender, 0.4–1.5 cm. long, about 0.35 mm. wide, ferrugineo-villose. Sepals 4–5, oblong, 2.8–5.2 mm. long, 1.5–2 mm. wide, sparsely ciliate at apex and on margins; petals obovate-oblong to oblong, 5–6.5 mm. long, 0.8–2 mm. wide, obtuse to subacuminate at apex, subspatulate at base; filaments of stamens up to 7 mm. long, the anthers oblong, 0.7–1.2 mm. long; ovaries obliquely oblong, densely lanate, the styles 2–3.2 mm. long. Legumes oblong-rotund to inequilaterally oblong, up to 1.8 cm. long, 1.8 cm. wide, nuciform, minutely apiculate, the surface minutely crustose, the pericarp wall about 3 mm. thick.

MEXICO: TABASCO: Nacajuca, *Rovirosa 748* (US).
GUATEMALA: Los Andes, *Record 8832* (NY, Y); ALTA VERAPAZ: Chinajá, *Steyermark 45565* (F, US); Cubilguitz, *Steyermark 44557* (F); IZABAL: Río Chaciún, Jocoló, *H. Johnson 1291* (F, US); Quiriguá, *Standley 24254* (NY, US); near Cristina, *Steyermark 38671* (F).
HONDURAS: YORO: Progreso, *Hottle 23* (F); ATLÁNTIDA: San Alejo (?), *Standley 7873* (F); Tela, *Standley 52915* (A, F, NY, US), *56686* (A, F, G, NY, US); La Ceiba, *Yuncker, Koepper & Wagner 8007* (F, G, MO, NY, US).
BRITISH HONDURAS: *British Honduras Forest Dept. 5* (Y).

This relatively well collected species is, according to S. J. Record (cf. Britton & Rose's original description), " . . . one of the commonest trees of the forest" (Guatemala). The narrowly oblong to oblong-lanceolate leaflets, lustrous above, are striking. The densely flowered and compressed racemes resemble those of *C. trinitensis* but their rachises are shorter. The thickness of the wall (3 mm.) of the small nutmeg-like fruits is noteworthy. According to Record and Hess (*Timbers of New World* p. 252, 1943) the vernacular name is "pata de cabra" (goat's foot) because of the fancied resemblance of the paired leaflets to the foot of a goat.

5. CYNOMETRA HEMITOMOPHYLLA (Donn. Sm.) Donn. Sm. in N. Am. Fl. 23: 220. 1930. (T.: *Tonduz 7012*!).

Copaifera hemitomophylla Donn. Sm. in Bot. Gaz. 27:332. 1899.

Tree. Branchlets zig-zag, nodose or gnarled, glabrous, the lenticels numerous, small, and verrucose. Petioles 0.6–0.8 cm. long, glabrous. Leaflets elliptic, 9–14 cm. long, 3–5 cm. wide, obviously acuminate at apex, the wide side obtuse at base, the lamina reticulate, papillate (under mag.) especially above, the costa subprominent above, the secondary veins 15–20, curving arcuately near margin to join veins above, thin-coriaceous, inequilateral, curved falcately, glabrous. Bracts, bracteoles, and flowers not known. Rachises of racemes (in fruit) 0.5–1 cm. long, apparently solitary in the axil, glabrous. Pedicels 1–1.5 cm. long, 0.3–0.4 cm. wide, glabrous. Legumes suborbicular, 3–4 cm. long, up to 3.5 cm. wide, nuciform, the surface crustose-granular, the excrescences deciduous, the wall of the pericarp up to 2.8 mm. thick.

COSTA RICA: LIMON: Río Reventazón below Cairo, *Standley & Valerio 48799* (US); Santo Domingo de Osa (Golfo Dulce), *Tonduz 9972* (MO, NY); Palmar Norte Río Terraba, *Paul & Dorothy Allen 5264* (MO).

C. hemitomophylla, with perhaps the largest leaflets of the New World cynometras (*C. hostmanniana* excepted), is unfortunately known only from fruiting material.[6] The principal secondary veins of the leaflets are more numerous (15–20) than in any other species. Another character of especial interest is the glabrous pedicel of the fruit.

The local name of *C. hemitomophylla* is "Guapinol Negro" and the common name is "Cativo" (fide P. Allen, loc. cit.).

6. CYNOMETRA TRINITENSIS Oliver, in Hook. Ic. 2443. 1896.

Small tree. Branchlets smooth, glabrous or puberulent, the lenticels inconspicuous. Petioles 0.6–1 cm. long, puberulent; petiolules 1–2 mm. long. Leaflets obliquely ovate or oblong, 5–11 cm. long, 1.5–4.5 cm. wide, vaguely to obviously acuminate at apex, tapering acutely or cuneately on wide side, the costa prominent, the secondary veins 10–12, prominulous, the lamina inequilateral, coriaceous, smooth or rugulose above and below, lustrous, glabrous, obviously inequilateral, the intervenal areas rather indistinct above. Bracts rotund to ovate-lanceolate, 3–6 mm. long, 1.5–3.5 mm. wide, densely puberulent dorsally; bracteoles oblong, up to 4.2 mm. long, 0.5–0.8 mm. wide, carinate and densely puberulent dorsally. Racemes 1–3 per axil, the rachises 0.8–1 cm. long, puberulent, the flowers about 15 per rachis, the pedicels up to 0.8 cm. long. Sepals usually 4, oblong to subrotund, 3–3.5 mm. long, 1.5–3 mm. wide, puberulent dorsally at apex and base; petals lanceolate to oblong-lanceolate, 4–5.8 mm. long, 1.3–2 mm. wide, tapering toward base; filaments 4.5–6 mm. long, the anthers 0.6–0.9 mm. long; ovary

[6] Paul Allen writes (*The Rain Forest of Golfo Dulce Costa Rica* p. 191. 1956), that the flowers of *C. hemitomophylla* are "pale-brown [and] are produced from late August to nearly November."

oblong, about 2.5 mm. long, about 1.5 mm. wide, villose especially basally and on sutures, the hairs scattered on valves, the style 4–5 mm. long. Legume rotund, 2–4 cm. long, 2–4 cm. wide, the pericarp smooth, minutely granulose or crustulose, 2–2.5 mm. thick.

JAMAICA: Castelton Garden, collector ?, *collection no. 11* (NY).
TRINIDAD: Botanical Garden, collector ? (G); Government House grounds, *Broadway s. n.* (NY, US, P); Botanical Garden, *Britton 1183* (NY, US).
BRITISH GUIANA: Botanical Garden, Georgetown, collector ? (BRG).

C. trinitensis bears a striking resemblance to the Costa Rican *C. hemitomophylla* which unfortunately is known only from fruiting material. The principal secondary veins of the leaflets of *C. hemitomophylla*, however, are more numerous and proximate. The densely flowered and compressed racemes resemble those of *C. retusa*. The latter species, however, has more narrow leaflets, a shorter rachis, apparently longer sepals, and a densely hirsute ovary. The reduction in the number of hairs on the ovary is the most conspicuous floral character of *C. trinitensis* and is unique for the New World cynometras, *C. fissicuspis* and possibly *C. stenopetala* excepted. In the plate accompanying the original description this character was not accurately depicted despite the reference in the text to "ovario parce piluloso."

The type collection (obviously from Trinidad) was not located. Oliver, following the original diagnosis, states: "Trinidad, Crueger, Prestoe etc." Whether the species is native to Trinidad is not certain.

7. CYNOMETRA **hondurensis** Dwyer, sp. nov. (T.: *Schipp 1192* (A)!).

Arbores parvae. Ramuli laeves glabri saepe lenticellis inconspicuis. Folia glabra. Petioli 0.6–0.8 cm. longi. Foliola sessilia anguste oblongo-lanceolata, 6–12 cm. longa, 1.8–4.5 cm. lata, apice plerumque attenuato-acuminata, acumine circ. 1 cm. longo saepe subfalcate disposito, ultime emarginato, subequilateralia vel evidenter inequilateralia latere lato basi cuneata, latere angusto attenuato, costa supra prominula infra subprominente, venis secundariis principalibus ± 15 prominulis, laminis reticulosis tenui-coriaceis vel rigide chartaceis supra in siccitate obscure olivaceis. Racemi compressi, rhachidibus (hic alibus in fructu) 0.8–2 cm. longis, circ. 0.12 cm. latis puberulis. Bracteae bracteolaeque non visae. Sepala 4, oblonga, 2.5–3.8 mm. longa, 1–1.8 mm. lata, acuta vel acuminata (rare obtusa) omnino glabra praeter dorso basim puberulo; petala alba in vivo, anguste ovato-lanceolata vel angusto-oblonga, 3.2–4.6 mm. longa, 0.8–1 mm. lata, acuminata vel vix obtusa; antherae non visae; ovaria omnino pubescentia comis aliis appressis, valvis oblongis, 2.3–2.5 mm. longis, 1.5–1.8 mm. latis, stylo circ. 2.5 mm. long. Legumina (hic juvenilia) impare obovato-oblonga, 2.3 cm. longa, 1.5 cm. lata, apiculata compressa minute crustulosa.

BRITISH HONDURAS: Rio Grande River, *Schipp 1192* (A, G, MO, NY).

The foliage of the new species closely resembles that of *C. retusa* and *C. schottiana*, differing from the former in having only thin-coriaceous or stiff-chartaceous leaflets, much longer rachises of the inflorescences, longer petals, and larger and

more compressed fruits. *C. schottiana* on the other hand, has much larger and more numerous flowers, shorter rachises of the racemes, more elongate pedicels, and sepals with hairs restricted marginally. Like *C. retusa*, the new species bears apiculate fruits.

8. CYNOMETRA SCHOTTIANA Hochr. in Bull. N. Y. Bot. Gard. 6:275. 1910. (T.: *Schott XII 857*!).

Tree. Branchlets glabrous, the lenticels obvious and numerous. Petioles 0.6–1 cm. long, glabrous. Leaflets oblong to oblong-lanceolate, 8–13 cm. long, 3–5.5 cm. wide, the acumen up to 1.5 cm. long, obtuse to subauriculate on wide side at base, the costa subprominent, the secondary veins up to 20, prominulous, uniting near margin to form an undulating vein subparallel to margin, the lamina scarcely stiff-chartaceous, obviously inequilateral, glabrous. Bracts ovate or oblong, puberulent dorsally; bracteoles not seen. Racemes apparently one per axil, the rachises 0.2–0.3 cm. long, puberulent, about 3-flowered. Sepals 4–5 (often two almost completely united marginally), oblong-lanceolate to oblong, 4–5.3 mm. long, 1.8–2.8 mm. wide, glabrous except puberulent marginally; petals lanceolate, 6–7 mm. long, about 2 mm. wide, acute to acuminate at apex; filaments up to 9 mm. long, the anthers about 1 mm. long; ovaries densely pubescent, the style 2–3.8 mm. long. Legume oblong (here very immature).

COLOMBIA: EL CHOCÓ: Atrato and Truando Rivers, *Schott XII 857* (NY).

The few-flowered racemes and the elongate petals exceeded in length only by those of *C. cubensis* and *C. cuneata*, are noteworthy. Hochreutiner in his original description erred in describing the sepals as glabrous. The common name is "Tremantino".

The type collection in New York bears the collection number "*XII 857*" and not simply "*7*" as listed by Britton & Killip (Ann. N. Y. Acad. Sciences 35:193. 1936).

9. CYNOMETRA MARGINATA Benth. in Hook. Lond. Jour. Bot. 2:100. 1840.

Tree. Branchlets rough, usually conspicuously lenticellate, glabrous to puberulent. Petioles up to 3.5 mm. long, glabrous to puberulent. Leaflets sessile, oblong, sublanceolate or narrow elliptic, 4–7 cm. long, 1.5–3 cm. wide, scarcely attenuate to acuminate, emarginate, the wider side subauriculate to scarcely obtuse at base, the costa prominulous above and below, the principal secondary veins 10–15, immersed to prominulous above, prominulous to subevanescent below, the lamina thin-coriaceous, inequilateral to subequilateral, minutely papillate to rugulose above and below, reticulate, glabrous, the margin often thin-callose, occasionally crisp. Bracts oblong, up to 2 mm. long, densely pubescent on back. Bracteoles oblong, up to 1.5 mm. long, obviously carinate, the hairs elongate along carina. Racemes 1–2 per axil, the rachises 0.2–1.8 cm. long, 8- to 15-flowered, densely aureo-puberulent, the pedicels 0.5–1 cm. long, about 0.35 mm. wide (at anthesis), puberulent. Sepals 3–4, often 2 united marginally, almost completely or only to middle, ovate-oblong,

oblong-rotund to narrowly ovate-oblong, 2.5–6.5 mm. long, 2–5 mm. wide, obtuse to subacute at apex, puberulent to scattered-villose on back, the hairs often confined below middle; petals narrow-lanceolate to narrow-oblong, 3.5–7 mm. long, 1–3.5 mm. wide, acuminate to obtuse at apex, obtuse to somewhat clawed at base; filaments of stamens up to 13 mm. long; the anthers 0.6–1.1 mm. long; ovary oblong, up to 3 mm. long, densely hirsute, most hairs elongate and ascending, some shorter and more flaccid, the style 2.8–4 mm. long. Legume oblong, up to 2 cm. long, vaguely rugulose to somewhat smooth, crustulose, the pericarp about 1 mm. thick.

KEY TO THE VARIETIES

Leaflets obviously reticulate.
  Leaflets oblong, sublanceolate or narrow-elliptic, scarcely acuminate, coriaceous.....
  .....9a. *C. marginata* var. *marginata.*
  Leaflets elliptic, obviously acuminate, the acumen 1–1.5 cm. long, chartaceous.....
  .....9b. *C. marginata* var. *guianensis.*
Leaflets smooth and not reticulate.....9c. *C. marginata* var. *laevis.*

9a. Cynometra marginata var. marginata.

Panama: Savanna north of Panama City, *Brother Paul 463* (F); Paraíso Station, *Hayes 29* (K).

Surinam: without specific locality, *B. W. 658* (U); Forest Reserve Section, *B. W. 1257* (U); Kaboerie, *B. W. 4885* (K, NY, U); Sectie O, *B. W. 5868* (MO, U); Sectie O, *B. W. 6086* (U); Tibiens River, *Tresling 300* (U); Coppename River near Raleighfalls, *Lanjouw 858* (MO, U); Surinam River near Kabel, *Lanjouw 1219* (K, NY); Marowijne River, *Lanjouw & Lindemann 2964* (U); Saramacca River Headwaters, *Maguire 23906* (NY); Boachland, Saramacca River, village Jacob Kondre, *Maguire & Maguire 23856* (F, MO, NY, V); Posoegronoe, Saramacca River, *Maguire & Maguire 24040* (MO, NY, U); Boaschland, *Maguire 24040a* (U, V).

British Guiana: *British Guiana Forest Dept. 6217* (NY, U).

Venezuela: Río Orinoco between mouth Río Atabapo and Cano Masagua, *Level 89* (NY); bolívar: Cerro Guaiquinima, 1 mile above Raudal Aquacanta, *Maguire 32705* (NY, V); Laguna de los Chivos (Municipo Upata), *Delgado 216* (V).

Brazil: pará: without specific locality, *Schomburgk 197 (169)* (F, K, V, W); Remansao, Tocantins, *Froes 23600* (NY); Rio Capim between Aproagu and Igarapé Canduru; Rio Tapajoz, *Ducke 16898* (R).

C. marginata is apparently the most difficult of all the New World cynometras to circumscribe because of the variability of its leaflets, which are typically thin-coriaceous, narrowly lanceolate, and scarcely attenuate apically. While the minutely papillate laminae furnish a character permitting one to segregate it from its ally, *C. spruceana*, nevertheless, other foliage characters are not stable, viz. the reticulate surface and the prominulous character of the secondary veins. The rachises of the racemes are strikingly variable in length, apparently an unusual feature for the New World cynometras. Other characters, perhaps of secondary importance, are the occasional reduction of sepals to 2, occasionally glabrous sepals, and the variability in the length and width of the petals. The reduction in number of sepals to 2 is otherwise found only in the Mexican *C. oaxacana.*

9b. Cynometra marginata var. **guianensis** Dwyer, var. nov. (T.: *Schomburgk 777* (NY)!).

Foliola elliptica, 3–8 cm. longa, 1.2–3 cm. lata, conspicue attenuato-acuminata acumine 1–1.5 cm. longo, costa supra plerumque pubescente, chartacea, plerumque vix inaequilateralia.

Surinam: Nicckerie, *Gongyryp & Stahel 1010* (U).
British Guiana: without specific locality, *Richard Schomburgk s. n.* (G, U, W); *Richard Schomburgk 1533* (U); *Robert Schomburgk (Herb. Hance 7667)* (W); *Schomburgk 777* (NY, V, W).
Venezuela: bolívar: Alto Río Paragua, *Cardona 884* (US).

The Schomburgk collections of the new variety are recognized with ease inasmuch as the leaflets are strongly attenuate-acuminate and chartaceous. The material from Surinam and Venezuela was difficult to assign to this taxon.

9c. Cynometra marginata var. **laevis** Dwyer, var. nov. (T.: *Froes & Murça 24014* (NY!)).

Foliola laevia nitida venis secundariis supra evanescentibus. Fructus globosi suturis conspicuis.

Brazil: pará: Rio Capini between Aproaga and Igarapé Candiri, *Froes & Murça 24014* (NY).

The glossy leaflets with the secondary veins scarcely visible mark the new variety. The fruit is more rotund than in *C. marginata* var. *marginata*. It is difficult to say whether the conspicuous sutures of the valves represent a substantial distinguishing character inasmuch as fruiting material of *C. marginata* is so poorly represented in herbaria.

10. Cynometra oaxacana Brandgee, in Univ. Cal. Publ. Bot. 6:180. 1915. (T.: *Purpus 7383*!).

Cynometra colimensis Britton and Rose, N. Am. Fl. 23: 220. 1930. (T.: *Ferris 6237*!).

Shrub to large tree. Branchlets glabrous or puberulent, the lenticels prominent. Petioles about 0.5 cm. long, glabrous. Leaflets obliquely ovate-oblong, ovate-lanceolate, rarely oblong-subrotund or narrow-oblong, 3.5–8 cm. long, 1.5–5 cm. wide, obtuse on wide side at base, the costa prominent or prominulous, the secondary veins ± 10, prominulous, the lamina vaguely to obviously papillate above (sub mag.), reticulate above and below in thinner more mature leaves, thin-coriaceous, very inequilateral, glabrous. Bracts oblong to ovate-oblong, 2.5–3 mm. long, up to 3 mm. wide, puberulent dorsally and marginally; bracteoles located about 1 mm. from base of pedicel, oblong, up to 2 mm. long, carinate, scattered pubescent on back. Racemes one to 3 per axil, the rachises 0.5–2 cm. long, ± 8-flowered; pedicels 0.6–1.2 cm. long, densely aureo-pilose; sepals 2–5, often a pair fused below middle, oblong, ovate-oblong to ovate, 2.5–4 mm. long, 1.2–3 mm. wide (or up to 4 mm. wide if 2 fused), glabrous or puberulent dorsally; petals oblong to obovate-oblong, 3.5–5 mm. long, 1–1.6 mm. wide, often subfalcately

disposed, obtuse to vaguely clawed at base; filaments up to 7 mm. long, the anthers subrotund, 0.7–1 mm. long, 0.6–8 mm. wide; ovaries obliquely oblong to subrotund, 3–4.5 mm. long, 2–2.5 mm. wide, densely pilose, style up to 3.5 mm. long, subcrassate, glabrous to pilose above middle. Legume oblong, up to 3 cm. long, up to 1.6 cm. wide, minutely granulose or crustulose, the wall of the pericarp up to 0.5 mm. thick.

MEXICO: without locality, *Hinton 10893* (U); COLIMA: Manzanillo, *Ferris 6188* (US), *6237* (A, NY); GUERRERO: La Lagunilla, *Nelson 7004* (US); Zihuatanejo, *Langlassé s. n.* (P), *Langlassé 441* (F, G, US); OAXACA: Cerro de Picacho, *Purpus 7383* (F, LA, MO, NY); CHIAPAS: Aguacate Palenque, *Matuda 3796* (F, NY).

Two characters mark *C. oaxacana:* the oval-oblong or ovate-oblong leaflets scarcely acuminate at the apex and the reduction in the number of the sepals (2–3). Some of the smaller leaflets of *Purpus 7383* (MO) have a thick lamina which is not obviously papillate and reticulate below, thus differing markedly from the larger leaflets. A similar variation in the thickness, surface character, and venation of the leaflets on a single collection (*Spruce s. n.* (K), type of *C. spruceana* var. *spruceana*) was encountered.

11. CYNOMETRA CRASSIFOLIA Benth. in Hook. Lond. Jour. Bot. 2:100. 1840.

Small tree. Branchlets often wiry and zig-zag, angular in cross-section, rough or smooth, glabrous or puberulent. Petioles 0.4–0.8 cm. long, slender, glabrous or puberulent. Petiolules up to 0.1 cm. long. Leaflets oblong-lanceolate, ovate-lanceolate, rarely subtrapezoid, 3.6–9 cm. long, 1.5–4 cm. wide, short-acuminate at apex, the wide side obtuse or tapering narrowly at base, the costa prominulous, glabrous to puberulent, the secondary veins prominulous, the most basal 1 or 2 strict and spreading flabellately, the upper arcuate-ascending, plane or prominulous above, prominulous and conspicuous beneath, the lamina minutely papillate above and below, reticulate, subcoriaceous or stiff-chartaceous, inequilateral, the wide side usually thrice the diameter of the narrow side, glabrous above, glabrous or puberulent below. Bracts ovate to subrotund, up to 2 mm. long; bracteoles not seen. Racemes solitary in the axils, the rachises up to 0.5 cm. long 8- to 10-flowered. Pedicels 0.6–1.2 cm. long, about 0.7 mm. wide in middle. Sepals 4, ovate to oblong, 2.5–3.5 mm. long, 1.3–2.8 mm. wide, puberulent dorsally; petals narrow-oblong, narrow-lanceolate to obovate-oblong, 4.5–5.2 mm. long, 1.2–1.6 mm. wide, obtuse to somewhat clawed at base; filaments up to 8 mm. long, the anthers oblong, about 0.6 mm. long; ovaries obliquely oblong, completely pubescent. Mature legumes not seen.

BRAZIL: locality and collector unknown (P, probable type); without specific locality, *Geoffrey* (?) *s. n.* (P).

ECUADOR: MANABI: Recreo, *Eggers 15752* (F, US); ORO: Piedras, *Little 6622* (US).

In the herbarium in Paris I located a specimen labeled *Cynometra crassifolia* Benth. ex ipso Brésil. This is probably the type inasmuch as Bentham, in describing *C. crassifolia*, stated that "I have seen the three following American species in the Paris Herbarium" (including *C. crassifolia*).

12. CYNOMETRA **stenopetala** Dwyer sp. nov. (T.: *Krukoff 6631* (NY)!).

Arbores 18–30 m. altae. Ramuli laeves glabri. Petioli 2–5 mm. longi, marcescentes glabri. Foliola 2 sessilia inaequilateralia vix falcata oblique oblongo-lanceolata vel oblonga, 3–8 cm. longa, 1–3.3 cm. lata, breviter acuminata retusaque, latere angusto gradatim attenuato, latere lato obtuse disposito, costa utrimque subprominente glabra, venis secundariis principalibus 10–12 prominulis vix ascendentibus ultime venam marginalem conspicuam dispositis, coriacea laevia brunnea glabra?. Racemi fasciculati rhachidibus plerumque pluribus per axillam, 1–7 (–10) mm. longis. Bractae crebrae mox deciduae ovatae vel ovato-rotundae intus glabrae extus puberulentes. Bracteae oblongae, circ. 2.5 mm. longae, 0.5 mm. latae, carinatae dorso ciliatae infra medium pedicellorum affixae. Flores 4–10 per rachidem. Pedicelli (hic in fructu) circ. 6.5 mm. longi, circ. 0.8 mm. lati, lignosi. Sepala 4, oblonga vel ovata-oblonga, 2–3 mm. longa, 0.9–2 mm. lata, obtusa glabra praeter dorso marginibusque; petala lanceolata, circ. 2.8 mm. longa, circ. 1 mm. lata, acuta basi subspathulata glabra; stamina 10, filamentibus vix basi cohaerentibus, ad 6.5 mm. longis, circ. 0.1 mm. latis, antheris non visis; legumina turgida subrotunda, ad 1.3 cm. longa, in forma nuculae constructa suturis copiose aliter sparse pubescentibus, crustulosa vel granulosa pericarpio spongioso, ad 3 mm. crasso, seminibus solitariis loculum explentibus.

BRAZIL: AMAZONAS: Humayatá near Livramento on Rio Livramento, *Krukoff 6631* (A, NY, U, US); Humayatá near Tres Casas, *Krukoff 6439* (A, F, NY, US); São Paulo de Olivença near Palmares, *Krukoff 8418* (U).

All of the specimens are in the late flowering or juvenile fruit stage. Fortunately sepals and to a less extent, petals may be found after a careful search. The petals, not exceeding 2.8 mm. in length are smaller (2–3 mm.) than those of any of the other New World cynometras except *C. bauhiniaefolia* and *C. microflora*. On the basis of leaflet venation, however, the species appear unrelated, inasmuch as *C. stenopetala* has the principal secondary veins on the wider side of the lamina regularly spaced, while *C. bauhiniaefolia* and *C. microflora* have the lowermost 2 or 3 secondary veins flabellately disposed. Vegetatively the new species appears to be closely related to *C. spruceana*. The short-pedicelled flowers borne on short rachises scarcely resemble the long-pedicelled flowers of *C. spruceana* which are disposed in lax racemes on relatively elongate rachises. *C. stenopetala* seems to be more closely related to *C. marginata* and to *C. crassifolia*; it is readily distinguished from these by its more coriaceous leaflets, smaller sepals and petals, and the ovary (judging from the condition of the juvenile fruit) presumably bearing only few hairs on the valves. Reduction in the number of ovarian hairs is elsewhere encountered only in *C. trinitensis*.

13. CYNOMETRA CUNEATA Tul. in Arch. Mus. Paris 4:179. 1844. (T.: *Richard s. n.*!).

Tree. Branchlets smooth, drying silver-brown, puberulent, the lenticels inconspicuous. Petioles 0.5–1.8 cm. long, crassate, glabrous. Leaflets rhomboid-

ovate to elliptic-lanceolate, 6–11 cm. long, 2.3–4.3 cm. wide, the acumen up to 1.2 cm. long, or short-acuminate to almost obtuse, obviously obtuse at base on wider side, the costa prominulous above, usually rather prominent beneath, glabrous, the principal secondary veins ± 15, very prominulous but rather evanescent above, prominulous beneath, the margin thin-callose, the lamina thin-coriaceous, minutely papillate above and below, scarcely to obviously inequilateral, obviously reticulate below, glabrous. Bracteoles narrow-oblong, up to 3 mm. long, puberulent on back, attached basally. Racemes prominent, usually one per axil, the rachises slender, 2–3.5 cm. long, 10- to 20-flowered, puberulent, the pedicels 0.8–2 cm. long, about 0.5 mm. wide (up to 1.5 mm. wide in fruit), scarcely pubescent, smooth, rubescent. Sepals oblong, 4–5.5 mm. long, 2–2.8 mm. wide, obtuse, glabrous except for few scattered hairs at apex; petals lanceolate to obovate-oblong, 7–7.5 mm. long, 1.6–2.2 mm. wide, acute to obtuse at apex; filaments up to 9 mm. long, the anthers 0.8–1 mm. long; ovary oblong, about 3.5 mm. long, about 2.2 mm. wide, the hairs dense, appressed, sericeous. Legumes oblong, up to 3.3 cm. long, up to 1.5 cm. wide, plump, finely rugulose, crustulose or minutely papillate, velutinous at first, then glabrate or glabrous.

VENEZUELA: BOLÍVAR: Raudal Arutani, Alto Paragua, Guayana, *Cardona 865* (V).
BRAZIL: PARÁ: without specific locality, *Richard s. n.* (P); Juruá, *Ducke 16894* (K, US); Belém do Pará, *Ducke 20208* (US); Caracari, Rio Branco, *Kuhlmann 1067* (R); RIO DE JANEIRO: without specific locality, *Glaziou 13756* (G).

The relationship of *C. cuneata* and *C. spruceana* is suggested by their similar foliage. *C. cuneata*, however, has longer petioles, often rhomboid-ovate leaflets which are papillate and bear prominulous secondary veins. Likewise the rachises and pedicels are longer, the flowers more numerous and the petals longer, thus suggesting closer relationship with *C. longifolia*. Unlike *C. spruceana* the bracteoles are attached basally. The uniformly appressed hairs of the ovary are unique among the New World cynometras.

14. CYNOMETRA SPRUCEANA Benth. in Mart. Fl. Bras. 15(2):247. 1876. (T.: *Spruce s. n.* ?)

Small trees; branchlets smooth, glabrous to puberulent; petioles 2–7 mm. long, usually puberulent; petioles absent or up to 1 mm.; leaflets narrow-oblong, subovate-oblong to obovate oblong, 2–8.5 (10) cm. long, 1–4 cm. wide, vaguely to obviously acuminate at apex, ultimately emarginate, oblique at base, the wider side tapering obtusely, or subtruncate at base, the narrow side acute (tapering usually beginning near middle part of blade), the costa plane to prominulous above, often with groove on each side, prominulous below, the secondary veins scarcely prominulous to plane or immersed (?) above, the margin regular, occasionally revolute, thin to moderately thick-coriaceous, obviously inequilateral, rugulose, often obviously reticulate below; racemes usually 1–2 per axil, the rachis slender, puberulent, 0.7–2 cm. long, (6-) 10- to 15-flowered, the pedicels filiform (about 0.5 mm. wide), 0.5–2 cm. long, densely puberulent; bracts soon deciduous, oblong-rotund to rotund, up to 5 mm. long and 5 mm. wide, densely or moderately

puberulent on back and margins; bracteoles deciduous, up to 3 mm. long, densely puberulent on back, carinate, thickened apically, the bracteole scars 2–5 mm. above proximal end of pedicel; sepals 4 (or 3 by fusion of 2), oblong, ovate-oblong to subrectangular, 3–4.8 mm. long, 1–2.3 (–3) mm. wide, obtuse to subacuminate at apex, usually obviously puberulent on back, often ciliate on margins; petals oblong to obovate-oblong, 5–7.5 mm. long, 1.8–2.3 (–3.2) mm. wide, obtuse to acuminate at apex, vaguely to obviously clawed at base; filaments 5–10 mm. long, the anthers 0.9–1.3 mm. long, 0.5–0.7 mm. wide; ovaries oblique-oblong, 2–3.8 mm. long, 1–2 mm. wide, densely pubescent, the style up to 5 mm. long; legume oblong to subrotund, 2.5–3 cm. long, 1–1.5 cm. wide, the suture of valves distinct, plump, obviously rugulose, minutely granulate and puberulent.

KEY TO THE VARIETIES

Leaflets conspicuously or only vaguely acuminate at apex.....14a. *C. spruceana* var. *spruceana*.
Leaflets obviously obtuse at apex.....14b. *C. spruceana* var. *phaselocarpa*.

14a. Cynometra spruceana var. spruceana.

Trachylobium martianum Hayne, in Flora 10(11):744. 1827.
Cynometra spruceana var. *β procera* Benth. in Mart. Fl. Bras. 15^2:248. 1876. (T.: *Spruce 3479*!).
Cynometra spruceana var. *γ macrophylla* Benth. in Mart. Fl. Bras. 15^2:248. 1876. (T.: *Spruce 513*!).
Cynometra martiana (Hayne) Macbr. in Contr. Gray Herb. 59:19. 1919.

British Guiana: without specific locality, *Schomburgk 197 (168)* (W).

Venezuela: bolívar: Laguna de los Chivos (Municipio Upata), *Delgado 216* (G, US); *Pittier 216* (G); amazonas: Cano Macasi, Capihuara, Alto Casiquiare, *Llewelyn Williams 15593* (US, V).

Colombia: Río Apaporis between Río Pacoa and Río Kananari, *Schultes & Cabrera 12616* (US).

Brazil: amazonas: Barra, Rio Negro, *Spruce 1513* (K, W); San Carlos, Rio Negro, *Spruce 3479* (NY, P, V, W). maranhao: Pedreiras, *Ducke 2320* (G, US); Manaús, *Schwacke 358* (US); Igarapé de Cachoeira Grande, *Ule 8864* (G, NY, U, US), *Ducke 719* (MO, US), *Ducke 24248* (U, US); Igarapé de Marapata, *Ducke 24247* (U). pará: without specific locality, *Spruce s. n.* (NY, P, W); Lago de Faro, *Ducke 8412* (G, US); Esposente municipio Almeirim, *Ducke 3549* (G); Santarem, Alter do Chao, *Ducke 10820*; Bas Xingú, Victoria, *Snethlage 10408* (G); Santarem, *Spruce 872* (K, P); Belém, S. forest of I.A.M., *Archer 7906* (F, K), *7943* (F), *8087* (US); Conceicas perto da Fóz do Rio Juruena, *Pires 3912* (NY); Cachoeira do Rio Arua, *Pires & Silva 4210* (NY); Rio Tucuruhy near Rio Xingú, *Kuhlmann 17655* (G, P, U, US).

Peru: loreto: Mishuyaca, Iquitos, *Klug 1448* (F, NY, US); Marañón, Iquitos, *Tessmann 3636* (F, G).

In 1919 Macbride effected the combination *Cynometra martiana* (Hayne) Macbr. maintaining that Baillon's earlier combination *Cynometra martiana* (Hayne) Baillon is untenable inasmuch as "it is a valid species of *Hymenaea* (*H. martiana* Hayne)." According to Macbride, Hayne's specific name *martiana* may be used for the "species of *Cynometra* which has heretofore borne the later published name of *C. spruceana*." No doubt he bases this on the fact that the plate in Hayne's Arzneigew (11: *pl. 17.* 1839), labeled *Trachylobium martianum* is a *Cynometra*.

However, the binomial C. *martiana* (Hayne) Macbr. is illegitimate, being a homonym of *C. martiana* (Hayne) Baillon which is applied to a valid species of *Hymenaea*. That this name has not been applied in the past to a *Cynometra* but to a species of *Hymenaea* makes no difference, the binomial *C. martiana* being already published.

After examination of type collections of Bentham's two varieties, *β procera* and *γ macrophylla*, I am unable to find any strong characters to substantiate giving them varietal status. Examination of the type material of var. *procera* deposited in Vienna shows leaflets of obviously different ages; the more mature leaflets are thicker with the secondary veins immersed above, and the venules inconspicuous beneath, while the more juvenile leaflets are obviously more reticulate beneath with the secondary veins prominulous above. Since Bentham distinguishes var. *procera* by "foliolis quam in forma typica minus coriaceis," it seems unwise to recognize this variety without additional supporting collections. As for var. *macrophylla*, the type collection deposited in Vienna has leaflets which are less elongate than those described by Bentham ("3–4 pollicaribus"); another character used by Bentham, the length of the racemes and the pedicels, is so variable in the typical material that it cannot be regarded as a strong one.

While the pedicels and rachises of the racemes are constantly filiform, there is considerable variation in their length; *Tessmann 3636*, for example, has elongate rachises but relatively short-pedicelled flowers; *Ule 8864* has both elongate rachises and elongate pedicels; *Pittier 216* has both short rachises and short pedicels.

Two excellent plates of *C. spruceana* are available, one in Hayne's Arzneigew 11: *pl. 17.* 1830, and the other in Martius Flora Brasiliensis 15^2:247. *pl. 65.* 1876.

14b. CYNOMETRA SPRUCEANA var. **phaselocarpa** (Hayne) Dwyer, comb. nov.

Vouapa phaselocarpa Hayne, in Flora 10(11):745. 1827.
Cynometra racemosa Benth. in Hook Lond. Jour. Bot. 100. 1840. (T.: *Spruce s. n.*!)
Cynometra obtusa Benth. in Pl. Spruce exs. Nomen.
Cynometra phaselocarpa (Hayne) Macbr. in Contr. Gray Herb. 59:19. 1919.

BRAZIL: AMAZONAS: Barra, *Spruce 1428* (K); Barra, Rio Negro, *Spruce s. n.* (F, NY, P, U, W); Santa Izabel, *Ducke 509* (A, NY, MO, US), *35415* (G, P, U, US); Manaus, Rio Tarumá, *Ducke 676* (F, MO, US), *Ducke 1010* (MO, US).

The obtuseness of the apex of the leaflets does not seem to be sufficient grounds to warrant the retention of *C. phaselocarpa* as a distinct species. In all other respects it bears a striking resemblance to *C. spruceana* var. *spruceana*, especially in the character of the lax racemes with elongate rachises and filiform pedicels. Ducke's collection *676* is important inasmuch as it bears legumes. The common name of the variety is "jutahy-rana" (fide Ducke).

15. CYNOMETRA LONGICUSPIS Ducke, in Bol. Técn. do Instit. do Norte. 2:11. 1944. (T.: *Ducke 1593*!).

Medium-sized trees. Branchlets terete, ultimately angular and arcuate, smooth, glabrous, drying purple to ashen-white. Petioles up to 8 mm. long, about 1.5 mm.

wide, slender, glabrous to scattered-puberulent; petiolules 0.5–1 mm. long. Leaflets oblong, up to 8 cm. long, up to 3 cm. wide, the acumen up to 1 cm. long, about 2.5 mm. wide in middle, ultimately emarginate, the sinus about 0.5 mm. deep, obtuse at base on wider side, the costa prominulous above and below, the secondary veins ± 10, immersed or plane, not markedly arcuate-ascending, the ultimate reticulations evanescent, the lamina coriaceous, lustrous above and below, rugulose above and below (sub mag.), inequilateral, glabrous (except possibly on costa); inflorescences, bracts, bracteoles and complete flowers not seen. Sepals (one seen) suboblong, 4 mm. long, about 1.3 mm. wide, glabrous; petals not seen; filaments (two seen) linear, about 7 mm. long, the anthers not seen; rachis of fruit woody, 2–5 mm. long, about 1.8 mm. wide, ligneous, glabrous. Pedicels ± 5 mm. long, somewhat smooth, apparently glabrous; legume obliquely oblong to oblong-rotund, up to 8 mm. long, up to 6 mm. wide, plump puberulent, rough and crustulose, the stipe up to 1.5 mm. long.

BRAZIL: AMAZONAS: Tocantins beyond Villa Velha, *Ducke 1593* (F, NY).

Ducke in his brief diagnosis of this species related it to *C. bauhiniaefolia* and to *C. spruceana*. He mentions the "poor fragments of old flowers [which] do not show differences from those of the widely distributed *C. bauhiniaefolia*." A study of the type material suggests that *C. longicuspis* is probably closely related to *C. spruceana*. The fruits of the latter species are more rugose.

Ducke states (loc. cit.) that it is a rather large tree found in very humid places at Tocantins and São Paulo de Olivença, at São Gabriel and its tributary, Rio Vaupes.

Two collections made by Froes (*22147* and *20723*), labeled *C. longicuspis*, are obviously misidentified. The former collection (in fruit) appears to be a *Peltogyne*.

16. CYNOMETRA LONGIFOLIA Huber, in Bol. Mus. Goeldi 5:384. 1908. (T.: *Ducke 9083*!).

Tree? Branchlets zig-zag, subterete, puberulent; the lenticels conspicuous. Petioles up to 0.7 cm. long, puberulent. Leaflets narrow-oblong, 7–12 cm. long, 2.5–2.8 cm. wide, tapering into an obvious acumen (up to 1 cm. long), subauriculate at base on wider side, the costa prominulous above, glabrous (except hairs occasionally scattered on under surface), lowermost pair of secondary veins usually arising sharply from one point at base of costa, the others well-spaced along length, prominulous to evanescent above, prominulous below, the lamina rugulose (under mag.), coriaceous, inequilateral, glabrous (except costa beneath). Bracts ovate, up to 5 mm. long, occasionally wider than long, often persistent, pubescent dorsally, the marginal hairs often tufted; bracteoles oblong, up to 6 mm. long, about 1 mm. wide, located near middle of pedicel, the hairs ferrugineous, more dense along median axis, tufted apically, the pedicels slender, about 1 cm. long, about 0.5 mm. wide. Racemes apparently solitary in the axils, the rachises up to 6 cm. long, up to 2 mm. wide, ferrugineo-villose, 30- to 50-flowered; sepals 4, widely to narrowly

oblong, 3–4 mm. long, 2–3 mm. wide, puberulent on outside especially below middle; petals lanceolate, 4–4.8 mm. long, 1.3–1.4 mm. wide, acuminate; filaments up to 8 mm. long, the anthers about 1 mm. long; ovaries (here in young fruit) about 4 mm. long, about 2.7 mm. wide, pilose. Fruit oblong, up to 2 cm. long, up to 1.4 cm. wide, obviously rugulose.

BRAZIL: PARÁ: Santarem, *Spruce s. n.* (W); Rio Mapuera, Maloquinha, *Ducke 9083* (G).

C. longifolia is obviously related to *C. spruceana* as evidenced by its narrowly oblong leaflets rugulose above, elongate rachises of the racemes, filiform pedicels, and bracteoles attached near the middle of the pedicels. It is readily distinguished by its large leaflets, persistent bracts, unusually elongate rachises, and multi-flowered racemes.

Huber originally described the ovary as sparsely villose; my dissections indicate that it is densely villose.

17. CYNOMETRA **duckei** Dwyer, sp. nov. (T.: *Ducke 7165b* (G)!).

Arbores. Ramuli ultime puberuli cortice in siccitate cinereo. Petioli ad 0.2 cm. longi, glabri vel puberuli. Foliola sessilia oblique oblongo-rotunda vel semi-ovata, 0.7–2.5 cm. longa, 0.5–1.5 cm. lata, apice obtusa emarginata, basi latiore latere obtuso, costa supra prominula gradatim ad apicem evanescente infra plana, venis secundariis ± 10 supra inconspicuis lamina nullo modo reticulata vel papillosa (sub mag.) inaequilaterale latiore latere duplo triploque plure, margine evidenter calloso; bracteae, bracteolae, rhachides, flores non visa; pedicelli (hic fructuum) ad 1.5 cm. longi, pubescentes graciles. Legumina, subrotunda, 1.2 cm. longa, 1 cm. lata, turgida evidenter tuberculata vel rugosa crustulis parvis deciduisque ornata.

BRAZIL: AMAZONAS: Rio Negro, *Ducke 7165b* (G, US).

After considerable deliberation I have decided to describe this as a new species. Ducke labeled the material *C. parvifolia*. Its foliage bears a closer resemblance to that of *C. spruceana*, among the Amazonian species and, oddly enough, to *C. cubensis*. The leaflets are obviously much smaller and completely different in shape (due in part to the marked inequilateral condition) than those of *C. spruceana*. The most striking feature of the new species is the smoothness of the leaflets on the upper surface, with no evidence of these being reticulate or papillate; the secondary veins are scarcely visible and the costa tapers above the middle, disappearing toward the apex of the lamina. Only one legume was seen.

18. CYNOMETRA BAUHINIAEFOLIA Benth. in Hook. Lond. Jour. Bot. 2:99. 1840.

Shrub or tree. Branchlets smooth, glabrous to minutely puberulent, the lenticels conspicuous. Petioles 0.2–0.6 cm. long, glabrous to densely pilose. Leaflets obliquely ovate-oblong to ovate-lanceolate, 1–4 cm. long, 0.5–2 cm. wide, the costa prominulous above, the secondary veins 7–8, of these 2–3 obviously spreading

flabellately from base of costa on wide side and scarcely distinguishable from costa basally, the lamina reticulate, vaguely papillate to scarcely papillate below, thin-coriaceous, obviously inequilateral, glabrous to minutely puberulent. Bracts oblong to ovate, 1–2.3 mm. long; bracteoles oblong, up to 2 mm. long, carinate, densely pilose. Racemes compressed in axils, the rachises apparently usually several per axil, 1–4 mm. long, pubescent, usually 4- to 9-flowered; pedicels up to 7 mm. long, puberulent; sepals 3–4, widely oblong, ovate-oblong or obovate-oblong, 2.5–3 mm. long, 1–3.5 mm. wide; petals ovate to obovate-oblong, 2–3.6 mm. long, obtuse to acuminate at apex, obtuse to cuneate at base; filaments of stamens 4–9 mm. long, the anthers 0.5–0.7 mm. long; ovaries oblong to oblong-rotund, 2–3.5 mm. long, 1.5–2 mm. wide, completely pubescent, the style up to 5 mm. long. Legume oblong to subrotund, up to 2.5 cm. long, up to 2 cm. wide, rugulose or tuberculate, minutely and densely tomentose, the wall of pericarp up to 2 mm. thick.

KEY TO THE VARIETIES

Shrubs or trees; leaflets obviously reticulate, the margin not curled; flowers white.
- Leaflets 1–4 cm. long, 0.5–2.0 cm. wide, glabrous to minutely puberulent on costa below; petals up to 2.8 mm. long ..... 18a. *C. bauhiniaefolia* var. *bauhiniaefolia*.
- Leaflets 4–6 cm. long, up to 3 cm. wide, completely puberulent; petals up to 5.5 mm. long ..... 18b. *C. bauhiniaefolia* var. *grandiflora*.

Large trees; leaflets lustrous, not conspicuously reticulate, the margin obviously curled; flowers yellow ..... 18c. *C. bauhiniaefolia* var. *meridiana*.

18a. Cynometra bauhiniaefolia var. bauhiniaefolia.

Guatemala: alta verapaz: Río Icvolay between Río Apia and Río Soctela, *Steyermark 45034* (F).

Surinam: without specific locality, *Schweintz s. n.* (NY); Commewijne, *B. W. 1137* (U); Surinam River, *Mell 17* (US).

British Guiana: without specific locality, *Richard Schomburgk s. n.* (G, W); Pirara, *Schomburgk 241* (W); Berbice, *Schomburgk 230* or *231* (F, G, K, NY, W); Rio Essequibo, *Herb. N. Y. Bot Gard. Field no. G 126, Record 6217* (NY); Essequibo River, *British Guiana Forest Service 6217* (G, NY, U), *6126* (G); banks of Cerenlyne Epiro, *Im Thurn s. n.* (K); Takutu River, S. Lethem, Rupununi District, *Irwin 814* (US).

Venezuela: without specific location, *Maguire & Maguire 4047* (K); bolívar: La Pargua, *Killip 37611* (G, NY, US, V). amazonas: El Bagre, Pto. Ayacucho, *Llewelyn Williams 1307* (US).

Colombia: Río Guaviare, San José del Guaviare, *Cuatrecasas 7754* (US).

Brazil: without specific locality, *Newman s. n.* (G); *Burchell 8830* (K); *Burchell 9951* (NY, P); amazonas: Jaru, Rio Branco, *Kuhlmann 2919* (U, US, P); Rio Branco, S. Bento, *Ule 7776* (G, K, US); Rio Branco, Faz. S. Bento, *Black 51-13287* (US); Rio Sinho, Juruema, Rio Jutuhy, *Froes 21043* (F, K, NY, US); Bõa Vista, Rio Branco, *Ducke 1355* (K, NY, (only part of sheet), US); Tefé, *Pires 1327* (NY). pará: Tapajoz, Bõa Vista, *Capucho 529* (F); Faz. Tuiuiu, Rio Arari, *Black, Ledaux & Stegemann 52-14-284* (US). rio de janeiro: Quinta de São Christovao, *Glaziou 18426* (P).

Peru: san martín: Ucayli, *Tessmann 3444* (G, NY). loreto: Río Haya, *Llewelyn Williams 40* (F); Pro, Amazon River, *Llewelyn Williams 1984* (A, F, US); Río Mazan near Iquitos, *Llewelyn Williams 8142* (F).

Argentina: corrientes: Mercedes, *Rodrigo 782* (NY).

Chile: without specific locality, *McJohn Style s. n.* (G).

C. bauhiniaefolia with the most extensive geographical range among the New World cynometras is readily recognized by the arrangement of the secondary veins

of the leaflets inasmuch as the lowermost 2 or 3 (on the wider side) arise flabellately from the proximal part of the costa. These are as prominent near their point of origin as the adjacent costa. A striking feature is the thick-walled fruit which is densely tomentose.

18b. CYNOMETRA BAUHINIAEFOLIA var. **grandiflora** Dwyer, var. nov. (T.: *Ducke 16896* (U)!)

Foliola ad 6 cm. longa, omnino puberula; petala ad 5.5 mm. longa.

BRAZIL: PARÁ: Botanical Garden, Belem do Pará, *Ducke 16896* (P, U, US).

The new variety is readily distinguished by its unusually large leaflets which are entirely puberulent. The flowers are strikingly large.

18c. CYNOMETRA BAUHINIAEFOLIA var. **meridiana** Dwyer, Var. nov. (T.: *Jorgensen 2124* (MO)!)

Foliola laevia nitida venis secundariis evanescentibus marginibus conspicue crispis; flores lutei.

ARGENTINA: Formosa, *Jorgensen 2124* (MO, U); Formosa, Río Coltapick, Colonia Herradura, Boca del Bermejo, *Pedersen 1295* (US).

19. CYNOMETRA MICROFLORA Cowan, in Mem. N. Y. Bot. Garden 8(2):114–115. 1953. (T.: *Maguire & Maguire 29010*!)

Small trees; branchlets glabrous to puberulent; petioles up to 3 mm. long; leaflets ovate-rotund or oval-lanceolate, up to 2 cm. long, up to 1.5 cm. wide, conspicuously obtuse above, more rounded (on wider side) basally, the secondary veins 3–4, prominulous, somewhat evanescent above, the lowermost pair arising flabellately from base of costa and resembling the latter, thin-coriaceous, glabrous, smooth, obviously inequilateral; racemes compressed, the rachises scarcely measurable, few-flowered; pedicels filiform, glabrous, up to 5 mm. long; sepals oblong, up to 2 mm. long, 1 mm. wide; petals lanceolate, 2–2.5 mm. long, up to 0.8 mm. wide; filaments up to 2 mm. long, the anthers up to 0.5 mm. long; ovary oval, up to 1.5 mm. long, densely puberulent, the style up to 2 mm. long; legumes oblong-lanceolate up to 1 cm. long, up to 0.6 cm. wide, somewhat rugulose, densely puberulent.

VENEZUELA: La Urbana, Orinoco River, *Maguire & Maguire 29010* (NY, V).

This species is very closely related to *C. bauhiniaefolia* and may well be interpreted in the future as a variety of the same. Its small leaflets and flowers, as well as its glabrous pedicels distinguish it from its ally.

20. CYNOMETRA PARVIFOLIA Tul. in Arch. Mus. Paris. 4:181. 1844. (T.: *Hostmann 204*!).

Small or medium-sized tree. Branchlets smooth, densely puberulent. Petioles about 0.1 cm. long, densely pilose. Leaflets narrow-lanceolate, 1–1.8 cm. long, 0.2–1 cm. wide, the costa prominulous above, the secondary veins ± 7, the lower-

most spreading flabellately from base of costa, prominulous but inconspicuous above, the lamina reticulate, rugulose (under mag.), thin-coriaceous or coriaceous, inequilateral, glabrous. Bracts compressed-rotund to ovate-oblong, up to 2 mm. long; bracteoles located at base of pedicels, oblong, up to 1 mm. long, carinate, the hairs few, deciduous; racemes compressed, axillary, the rachises up to 5 mm. long, densely pilose, the flowers 4–6 per raceme; pedicels 0.4–1 cm. long, ferrugineo-villose. Sepals 4–5, ovate-oblong, oblong-rotund or subrotund, 3–4.6 mm. long, 1–2.6 mm. wide, glabrous or puberulent dorsally and marginally; petals oblong to obovate-oblong, 3.5–4.6 mm. long, 0.8–1.8 mm. wide, glabrous, or often with several weak hairs at apex, obtuse or clawed at base; filaments 4–10 mm. long, the anthers oblong, 0.4–1 mm. long; ovaries oblique-oblong, 1.3–2.5 mm. long, 1–2.5 mm. wide, densely pilose, the style ± 4 mm. long. Legume rotund, coccoid, up to 0.9 cm. long, 0.9 cm. wide, plump, the surface minutely crustulose, the wall of pericarp about 1 mm. thick.

SURINAM: without locality, *Hostmann 204* (NY); Marowyne and Gonine Rivers, *Gonggryp 3751* (U); Surinam River, *Kappler 1905* (U); Marowyne River, *Lanjouw & Lindemann 3471* (U).

BRAZIL: AMAZONAS: Caracarahi, Rio Branco, *Ducke 23788* (G, P, U, US); Bõa Vista, Rio Branco, *Ducke 1355* (NY, in part only).

C. *parvifolia* is readily distinguished by its very small leaflets (not exceeding 2 cm. in length) which are narrow-lanceolate. It appears to be closely related to C. *marginata* and to C. *bauhiniaefolia*.

21. CYNOMETRA HOSTMANNIANA Tul. in Arch. Mus. Paris 4:180. 1844. (T.: *Hostmann 169*!).

Medium-sized tree. Branchlets wiry, smooth, glabrous, the lenticels often inconspicuous. Petioles about 0.5 cm. long, glabrous to pubescent. Leaflets equilateral to subequilateral, ovate-lanceolate, oblong-lanceolate, 6–12.5 cm. long, 2.5–8 cm. wide, tapering sharply toward apex, usually short-acuminate, the wide side cuneate or sub-rotund at base, the costa prominulous above, the secondary veins ± 20, strict or scarcely arcuate, the lamina obviously reticulate, non-rugulose (under mag.), thick-chartaceous to coriaceous, subequilateral, glabrous. Bracts ovate-rotund to rotund, 1–1.3 mm. long, 1–1.4 mm. wide, puberulent dorsally and marginally; bracteoles absent. Racemes often umbelloid in shape, 1–4 per axil, the rachises up to 7 mm. long, puberulent, the pedicels slender, up to 1.5 cm. long, glabrous or sparingly pubescent. Sepals ovate-oblong to oblong, 2.8–4 mm. long, 1.1–1.9 mm. wide, glabrous or puberulent dorsally, puberulent at apex. Petals narrow-oblong, up to 4.5 mm. long, 0.4–1.5 mm. wide, acuminate at apex, obtuse at base; filaments up to 4 mm. long, the anthers oblong to oblong-rotund, 0.5–0.7 mm. long; ovaries oblong to oblong-rotund, about 2 mm. long, densely pubescent, the style up to 3.8 (5?) mm. long. Legumes oblong, up to 4.5 cm. long, up to 3.5 cm. wide, the surface obviously rugulose, the rugae minutely granulose, the wall of the pericarp up to 0.5 cm. thick, the sterile pods deeply wrinkled and without any locule.

FRENCH GUIANA: without specific locality, *Melinon s. n.* (A, F, NY, P, US); *Vaillant 101* (P).

SURINAM: without specific locality, *Haller s. n.* (U); *Wüllschlaegel 1438* (B), *1656* (B); *B. W. 198* (U); *B. W. 198a* (U), *B. W. 476* (U), *B. W. 3878* (U); *Lanjouw & Lanjouw 1891* (U); *Gonggryp 457* (U); *Lindeman 308* (U); Watamiri River, *B. W. 1508* (US); Watamiri, *B. W. 1958* (U), *3861* (U); Maroni, *Sagot s. n.* (W); *Sagot 1093* (U); Saramacca, *Stahel 198a* (NY, U, Y); Marowyne near Poeloegoedoe, *Versteeg 552* (U), *576* (U); Marowyne River, *Gonggryp 5357* (U); Coppename River, *B. W. 155* (U); Coppename, *Gonggryp 2568* (MO, U); banks of Surinam River, *Mell s. n.* (NY, US); Paramaribo, *Hostmann 169* (F, NY, W).

BRITISH GUIANA: Brandtwegt, Berbice River, *British Guiana Forest Dept. 6365* (U); without specific locality *Jenmann 1859* (NY, U).

BRAZIL: AMAZONAS: Amapa, Rio Oiapoque, *Froes 25771* (US); PARÁ: Trombetas (Cachoeira Porteira e Rio Cuminá-mirim), *Ducke 10911* (R).

A number of substantial characters serve to distinguish this species: the consistently equilateral leaflets, the minute bracts, the absence of bracteoles, and the often glabrous pedicels.

It is difficult to relate this species to the other New World cynometras. Its usually umbelliform racemes are suggestive of those of *C. trinitensis* and *C. retusa*.

A fragment of a leaflet from *Lanjouw & Lanjouw 1891* (U) was found to measure 8 cm. in width, indicating that the intact leaflets reach up to 20 cm. or more in length, thus presumably possessing the largest leaflets among the New World cynometras.

Despite the numerous collections of *C. hostmanniana* very few were found in fruit; the legumes when semeniferous, are deeply wrinkled on the surface and are thin-walled (the pericarp up to 0.5 mm. thick), a noteworthy fact considering that the valves are probably the largest (up to 4.5 cm.) among the New World species. The sterile fruits are very thick walled (cf. remarks in introduction, p. 317). Amshoff (Fl. Surinam) makes the interesting comment that the "infertile pods . . . at last splitting into 2, showing no cavity."

Common names assigned to the species include "Sakabali" (British Guiana), "Sahkaballi" (Surinam), "Malako" (Surinam), and "Makraka" (Surinam).

22. CYNOMETRA FISSICUSPIS (Pittier) Pittier, Arbol y Arbust. Venez. Legum. 1:132. 1928.

Copaifera fissicuspis Pittier, Arbol y Arbust. Venez. Dec. 2–3:25. 1923. (T.: *Pittier 10933*!)

Guibourtia fissicuspis (Pittier) Léonard, in Bull. Jard. Bot. de l'Etat Bruxelles 19 4:402. 1949.

Trees 25–30 m. high. Trunk erect with elongated crown. Twigs smooth and glabrous below, conspicuously lenticellate, the tips angular, puberulent. Petioles 0.5–2 mm. long, 0.1 cm. wide. Leaflets sessile, ovate to ovate elliptic, 2–4.5 cm. long, 0.8–2 cm. wide, the narrow side of lamina 0.4–0.8 cm. wide, the wide side 0.5–1.1 cm. wide, obtuse and emarginate, the sinus about 0.5 mm. deep, often apiculate at base of sinus, the narrow side of lamina attenuate toward base, the wide side of lamina auriculate at base, the costa prominulous above and below, the principal secondary veins 10–20, slender, prominulous, the lamina drying light green to light brown, subcoriaceous, glabrous, subequilateral to obviously inequi-

Fig. 1. *Cynometra fissicuspis*
Flower ×7; flowering twig ×2; fruit ×2.

lateral, reticulate. Racemes 1–2 per axil, the rachises up to 2 mm. long, the flowers ± 6 per rachis. Pedicels up to 6 mm. long, about 0.3 mm. wide, puberulent. Bracts up to 2 mm. long, concave, glabrous. Bracteoles narrowly oblong, up to 2 mm. long, about 0.5 mm. wide, vaguely carinate, sparsely hairy above middle to glabrous. Sepals 4–5, oblong, up to 3 mm. long, up to 2 mm. wide, glabrous, thin. Petals lanceolate, up to 3 mm. long, 0.5–1.1 mm. wide, acute or subobtuse at apex, glabrous; filaments up to 6 mm. long, about 0.15 mm. wide, the anthers up to 0.7 mm. long; ovary rotund, up to 2 mm. long, glabrous, the style up to 3 mm. long, the stigma capitate, the ovules solitary. Legumes obliquely orbicular, 1–2 cm. in diameter, falcately apiculate, indehiscent, the valves reticulate, and papillate or rugulose (sub mag.), a slender keel (up to 0.5 mm. wide) on dorsal side, the wall of pericarp about 0.5 mm. thick, the seeds solitary, filling the locule.

VENEZUELA: ZULIA: Río Lora, Santa Ana, *Pittier 10933* (GH, NY, US).
COLOMBIA: Río Zulia, *Nicéforo s. n.* (US); MADGALENA: Cucharo, *Castañeda 641* (MO).

This is the only species among the New World cynometras which has had a complicated taxonomic history. This is due to the fact that the type collections distributed to herbaria are all sterile and secondly due to Pittier's description of the leaflets as pellucid-punctate. The leaflets are not so characterized although some show (under magnification) areas which have become thinner, probably due to drying.

The flowering and fruiting material of *Nicéforo s. n.* provided a solution to the difficulty. The flowers are obviously those of a *Cynometra.* Their glabrous condition is unique for the New World species. Perhaps more noteworthy are the coin-like (thus section Nummus) legumes, smooth and reticulate on the surface, and the leaflets auriculate on the wide side at the base. The common name of *C. fissicuspis* is "Aracito" (fide Pittier).

Species Transferred or Excluded

I am transferring two species of *Cynometra*, apparently known only from Minas Geraës, Brazil, to the genus *Peltogyne.*

Peltogyne **glazovii** (Taub.) Dwyer, comb. nov.

Cynometra Glazovii Taub. Flora 75:76. 1892.

Type Locality: Minas Geraës, Brazil.

Distribution: Known only from the State of Minas Geraës, Brazil.

Brazil: minas geraês: sans locality, *Glaziou 13725*; *Glaziou 14617* (NY, P, US).

Peltogyne **riedeliana** (Harms) Dwyer, comb. nov.

Cynometra riedeliana Harms, Fedde Report 24. 209. 1928.

Type Locality: Minas Geraës, Brazil.

Distribution: Known only from Brazil.

Brazil: without locality, *Dorsett, Shamel & Popenoe 136b* (U); minas geraês: Serro do Corcovado, *Riedel & Luschnath 1182* (A, US); locality and State not decipherable, *Riedel 601* (?) (F, photo. and frag. of syntype collection of *C. riedeliana* ?).

Two important characters make it clear that the two species are referable to *Peltogyne*: the paniculate inflorescence and the glandular-punctate nature of the sepals and leaflets. The flowers of all of the cynometras, including the many species of the Old World, are in racemes and have non-glandular sepals. Another character of importance is the pubescence of the sepals on the inner surface; in all of the New World cynometras the sepals are glabrous within, except rarely at the very base. Unfortunately the fruits of *Peltogyne riedeliana* and *P. glazovii* are unknown.

Ducke in a recent paper (1949) has contributed valuable data on the Amazonian species of *Peltogyne.* From a study of his paper, as well as from a study of specimens it appears that *P. glazovii* and *P. riedeliana* belong to the *P. pauciflora*, *P. floribunda*, and *P. discolor* complex, segregated by Ducke in his key (loc. cit.).

I have excluded the following species from the main body of the paper for reasons discussed below.

1. CYNOMETRA ZAMORANA R. E. Schultes, Bot. Mus. Leaflet Harvard 13(10): 301–302. 1949.

C. zamorana is referable to the genus *Hymenaea*; the type of *C. zamorana* is *Schultes 5429* (GH) from Comisaria del Vaupes, Río Macaya, Cachivera del Diablo, Colombia.

2. CYNOMETRA SPHAEROCARPA Pittier, Enum. de Las Plantas Usuales 184. 1926.

Unfortunately I have not seen the type material (in fruit only) collected at Caruao, Federal District, Venezuela. Pittier not only fails to indicate the type collection but also mentions only a few characters which may be of importance: "las hojas inequilanceadas, largamente atenuadas . . . los frutos son subglobosos, de 3.5–4 cm. de diametro." Pittier states that the common name is "cobalonga", and adds that the wood is excellent for construction and the seeds are "estomáquicas y antipalúdicas".

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